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FIELD BOOK OF NORTH AMERICAN MAMMALS

*Descriptions of every mammal known
north of the Rio Grande, together
with brief accounts of habits,
geographical ranges, etc.*

By

H. E. ANTHONY, M.A.

Curator, Dept. of Mammals, American
Museum of Natural History

*With 32 coloured plates and 175 photographs,
pen-and-ink sketches and maps*

G. P. PUTNAM'S SONS

NEW YORK — LONDON

**FIELD BOOK OF
NORTH AMERICAN MAMMALS**

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by

H. E. Anthony

Seventh Impression

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INTRODUCTION

NEED FOR A FIELD BOOK

MANY books and papers have been written about North American mammals. Some of these have been written for the layman; by far the greater number have been penned for a very limited circle of readers, the mammalogists or scientific students of mammalogy. While the study of mammals has been going on for centuries, the field has been by no means worked out; there are many mammals today of which we know almost nothing, aside from their physical appearance. In common with all sciences, the intensive study of mammals has made great progress in recent years. We go to the older works, such as Audubon and Bachman, because they are classics, but in the light of present-day knowledge they fall short of our requirements. We have discovered so many new species which were unknown at that time, or we have so altered the system of classification in the attempt to improve the science, that the earlier writings do not bridge the gaps. It may be stated that there is no single publication today which attempts to give a full and adequate synopsis, with geographical distribution and notes on habits, of every North American mammal. The United States National Museum has published a very excellent check-list of North American mammals, written by Gerrit S. Miller, Jr., of which more will be said later, which is invaluable to students of mammals, but this volume by itself will not carry the layman far because it contains no descriptions and but few common names. There are complete descriptions, names, habits, etc., for the mammals of certain favored districts, and several very useful and valuable publications on the mammals of the country at large, the outstanding example of which is the recent four-volume work by Seton, the very finest book on mammals ever written for the layman. This latter is a limited, de luxe edition of a size to be used only in the library and, complete as it is, it does not deal with all of the smaller mammals.

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From the foregoing it can be seen that there is a real and definite need for a work of field book size which will give some space, brief though it may be, to each and every recognized species and subspecies of North American mammal. No single volume can be expected to contain all the data required by scientist and layman, and in this field book the layman is considered first. Early in planning the scope of the work I encountered obvious difficulties. These should be briefly explained to justify the plan which has been followed.

SCOPE OF THIS FIELD BOOK

There are 1,445 species and subspecies treated in the following pages. In dealing with this large number so much space has been used that the individual treatments have been condensed to the limit. The intention has been to give at least one full and detailed description in each group, and then by comparison or reference to this data hold the synopses of the other forms of the group to the minimum of space. Often the basis for separation of one species from another is of such a technical nature or so subtle in character that it is most difficult to describe for a lay reader. To omit completely all of the forms which fall into this category would create undesirable gaps in the field book. However, by using the geographical distribution as a key, one frequently is able to identify these troublesome, closely related forms, because we have had the distributions of the various groups worked out from large series of specimens and it is fairly well known where most of these animals belong. For the sake of providing a comprehensive catalogue, every North American mammal is therefore listed,¹ using the term North America to include all of the continent north of the Rio Grande and following Miller's *List of North American Recent Mammals* as authority. Maps to show the geographical distribution of many of the species are given as an aid in identification.

Unless he be a specialist, the reader will only be confused by discussions of the skull characters of mammals, and they are omitted, although the greater part of the classification of mammals is based upon skull characters. Frequently the

¹ With the exception of certain of the Bears of the genus *Ursus*, as explained on page 78.

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superficial characters given in this field book are not exclusively diagnostic, but under the circumstances they must suffice, and they will be found serviceable when taken in conjunction with the known geographical range. Apart from making the book too technical, the inclusion of skull characters for every form would require a work of not one but several volumes. Upon rare occasions, when a species has been so dependent upon cranial characters that superficial characters were too obviously inadequate, it has become necessary to employ these internal data. Many lovers of mammals see their specimens in the flesh and a description of external features is what is wanted. The more technical reader is referred to the constantly cited revisions which are given in the text and most of which are to be found in well-stocked libraries throughout the country. For anyone wishing to go beyond the handbook stage in his study of mammals, these revisions are not only helpful but an absolute essential.

STANDARD LIST OF SPECIES AND SUBSPECIES

Descriptions of new species and subspecies are continually being published. Since work on this field book began, quite a few such papers have appeared and it has become necessary to revise manuscript to include changes. For the purposes of the field book it has seemed advisable to draw a dividing line somewhere; otherwise the manuscript would have been unduly delayed by going back over copy to bring it up to date. Miller's *List of North American Recent Mammals* offered a satisfactory solution for this problem and the 1923 edition was chosen as the basis for this field book. However, I have used all subsequent papers for data other than new names and have attempted to consult every source up to the time of going to press; also the new names and changes of nomenclature in important revisions since 1923 have been used.

SOURCES OF DATA USED

Wherever possible, I have compiled the data for the synopses from the different revisions or monographs which have been written on North American mammals. These monographs are the published results of years of study and are based upon

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the accumulated collections of all the large museums. The reviser has borrowed all the available material he could find, and the insight he has secured makes his conclusions of much greater value than those of one who works with only a few specimens. I have cited these monographs throughout the book, and it may be stated that in many cases I have quoted or paraphrased directly from these works. The reviser, with his wealth of material, has chosen the most typical specimens as the basis for each description, and this is an aid in avoiding extreme examples. The description may be regarded more or less as a norm which is as often exceeded as not reached in the development of any character. Incidentally, I have had access to the fairly large and complete collection of North American mammals in the American Museum and have taken much data directly from the skins.

COMMON NAMES

While every mammal known to science has a scientific name, it does not follow that it has a vernacular or common name. On the contrary, only a small percentage of our mammals have good, distinctive, common names that serve to identify the different species and subspecies in large groups which may be represented by half a hundred species and subspecies. For example, consider the Chipmunks. Even a casual observer will recognize, in visiting different parts of the country, that there are many distinct varieties of Chipmunks. Yet he will find that in most sections the people know only the one name for the creature—Chipmunk. Popular interest in precise, common names for mammals has not reached the stage where qualifying adjectives have been applied to the group names. Wherever common names exist and can be used to clearly designate mammals, they have been taken for this volume. Some mammalogists, when they describe a species new to science and properly label it with a Latin name, have given at the same time an English common name. But most mammals either have not received convenient popular names or have been christened with stilted or poorly chosen names such as are little likely to come into general usage. A common name, to come into popular favor, must be sufficiently apt and descriptive to make recollection an easy matter; it must

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not be too long, and if there is something catchy about it so much the better. "Chipmunk" illustrates this point for it has become a fixed term all over North America, whereas a name such as "Little Striped Ground Squirrel" not only does not live long, but is confusing because there are "Little Striped Ground Squirrels" of several different genera, quite distinct mammals. It is no easy matter to create diagnostic common names which mean anything and yet find popular approval. In fact, there are very good arguments against giving each and every scientific form a vernacular or trivial name, and I have done so in the full knowledge that my action will be open to criticism. My answer will be that this field book is primarily for the layman and he will want common names; for others there are Latin names, and the common names may be ignored. Indian names are useful and from them we have taken "Woodchuck," "Sewellel," "Cacomistl," and "Jaguar," and so forth. Where it has been necessary to create a common name or select one from names already created, the attempt has been made to get a name as nearly as possible conforming to the requirements of brevity, significance and everyday usage.

MAMMALOGY AS A SCIENCE

And now, having called attention to the difficulties of classification in popular terms and the lack of common names, it should be stated that the study of mammals as carried on by specialists is by no means inexact or unscientific, but is precise and regulated to the last degree. Naturalists have formulated regular rules for the basis of classification and the creation of scientific names, and taking the tenth edition of Linnæus' *Systema Naturæ*, 1758, as the starting point, they have developed the study of mammals along definitely prescribed and universally (more or less) accepted laws. The classification of mammals is not just a game with highly artificial rules; wherever possible arbitrary assumptions and the personal equation have been eliminated, although these factors can never be completely eliminated. And this brings us to the methods employed to standardize results and to enable us to compare the data gathered by one worker with that brought together by all other workers.

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MEASUREMENTS

Measurements are habitually made in millimeters by mammalogists because of the widespread acceptance of the metric system in the fields of science. These measurements have been converted to inches in the field book, since most of the readers are accustomed to think in terms of inches. The basis of conversion from millimeters to inches is twenty-five; that is, twenty-five millimeters equal one inch (this is approximate, but so nearly exact that it serves our purpose). The measurements of mammals usually taken are total length, length of tail vertebræ, and length of hind foot.

The total length is the distance in a straight line from the tip of the nose to the tip of the tail, not including the hair on the end of the tail. This length is taken by a steel tape or ruler along the back of the mammal, with the body in a straight line, head, neck, and tail extended to give the exact length.

The length of the tail vertebræ is taken from the dorsal root of the tail to the fleshy tip of the tail, the hair on the end of the tail not being included. A common method of securing this dimension is to extend the tail upward at right angles from the back and measure from the rump, at the base of the tail, to the last bit of skin on the tail, the tail vertebræ to be kept perfectly straight. This measurement may also be taken by dividers which are applied to the specimen and then laid on a tape.

The length of the hind foot is taken from the edge of the heel to the tip of the longest claw, the foot extended and kept flat so that the curvature of the toes is straightened out.

These three measurements usually afford a very good index to the size of the mammal. Another useful measurement in some species is the height of the ear, measured either from the crown of the head or from the notch in the lowest part of the basal external margin. The method of taking the ear measurement is always stated "from crown" or "from notch." The length of head and body is often important and, of course, can be obtained from the basic measurements always taken, by subtracting the length of the tail vertebræ from the total length.

Weights of mammals are important. This data has not

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been very consistently gathered and is especially desirable in the case of large mammals. It is often very inconvenient and, because of the lack of the proper equipment, even impossible to take the weights of Deer, Bear, Mountain Lion, etc., but if sportsmen could secure the weights of their game it would not only help to fill in gaps in our knowledge of North American mammals, but it would also serve to correct the prevalent ideas of fabulous weights for our larger game mammals. It has been truthfully stated that, for some reason or another, the geographical ranges of the exceptionally large mammals never seem to coincide with the range of the Fairbanks scales.

DESCRIPTION OF COLOR

The description of the color of a mammal presents several difficulties, the most obvious being the determination of the actual color by the describer himself and the definition of the color in terms which will convey the correct color perception to the reader. Most mammals have color patterns made up of a blending of several colors or shades. The individual hairs may have two or three distinct color bands and the pelage may be made up of two or more types of hairs differently colored. The eye receives a general color impression from the blending of all of these, or upon closer inspection the general impression may be resolved into its components. In some cases the color descriptions in this field book apply to the tones and shades of the individual hairs, but when a pattern is plainly predominated by a single color, the description refers to the general impression.

Precise color nomenclature calls for a terminology which would often be troublesome for the average reader. Most mammalogists use color terms as set forth in Ridgway's *Color Standards and Nomenclature*, comparing directly with the charts given in that book. Wherever Ridgway's terms are more or less self-explanatory they have been used in this field book. Occasionally I have drawn upon more general and less restricted terms, either because the nomenclature of the precise shade is too technical or because the color pattern of the animal in question was so variable that the looser term best suited it.

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ACKNOWLEDGMENTS

To almost everyone who has written upon North American mammals I owe acknowledgment, for I have helped myself liberally wherever I found data. To the authorities of the American Museum of Natural History I am profoundly grateful, for without their permission to use collections, library, and other facilities I could not have undertaken this field book. To my colleagues, Dr. Frank M. Chapman and Dr. Frank E. Lutz, I am greatly indebted for advice on various matters which their experience with popular handbooks has qualified them to give. The members of my own department in the Museum have been of assistance in helping with some of the details which pile up in the work of this sort. The artists whose illustrations appear, Miss Olive Otis for color plates, Mr. Francis B. Shields for line cuts, and Mr. Frank Vitolo for maps, have worked under my direction and done much to relieve a lengthy text. In answer to my appeal for photographs, the naturalists whose work is shown have responded most generously and I am greatly obligated to them for their coöperation. In conclusion, I tender my sincerest thanks to my secretary, Miss Ida Grobe, whose unfailing interest, patience, and diligence have been of the greatest value to me and without whose help the long-suffering publishers would still be calling for copy.

I know that errors will be discovered in this book. I hope they will not be many. I have striven to keep the number as low as possible and when they do appear I take full credit, or discredit, for them. I shall be glad to have my attention drawn to such errors, not because I shall be pleased to learn of their existence, but because with this knowledge I shall be warned against their repetition.

WHAT IS A MAMMAL?

Mammals are warm-blooded vertebrates possessing twelve pairs of cranial nerves, a four-chambered heart, double circulatory system, thoracic cavity separated from abdominal cavity by a muscular diaphragm, skull articulating with atlas at two occipital condyles, lower jaw (a single bone on each side) articulating directly with skull, bodies covered by hair (if not in the adult stage at least during some part of the embryonic development) and two pairs of limbs (hind limbs lost or vestigial in Cetacea and Sirenia); they bear the young alive and nurse them at the breast. The name mammal is derived from this method of feeding the young at the mammæ or breasts. The chief distinctions between mammals and birds are the hairy covering, non-nucleate red blood corpuscles, and the bearing of live young nursed at the breast.

EARLY MAMMALS

The earliest known mammal has been found as a fossil in the deposits of the Triassic epoch, about 150,000,000 to 180,000,000 years ago.¹ Although comparatively few specimens of mammals have been discovered as far back as the Triassic, Jurassic, and Cretaceous, a large number are known from the Eocene, the following geological epoch, some 50,000,000 to 60,000,000 years ago, and scientists are able to trace the major development of most of our present-day mammals from these ancient ancestors.

Most of these ancestral forms seem to have been quite well-developed mammals and already very distinct from other quadrupeds. The mammals are believed to have been derived from reptile-like ancestors and the very first mammals are thought to have evolved from Cynodont reptiles early in the Triassic epoch. This places the birth of the class Mammalia so far back, roughly 200,000,000 years, that the time element

¹ Figures taken from Arthur Holmes, *The Age of the Earth*, 1927; and Joseph Barrer, *Rhythms and the Measurements of Geologic Time*, Bull. Geol. Soc. Amer., 1917.

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is beyond our complete comprehension. We may be certain that if typical well-specialized mammals lived in early Tertiary times we must look very much deeper into the past to find the very first mammal-like quadrupeds. Palæontology has a remarkable record of mammal history from the Eocene to the Recent, by no means complete, but full enough to reveal much data bearing on the appearance and development of the orders, families, and genera of present-day mammals.

CLASSIFICATION OF MAMMALS

Our modern system of the classification of mammals is based upon the external and internal structure, anatomy, of living mammals, and the internal structure of the fossil mammals of bygone epochs. As a rule, only the hard parts of mammals are preserved as fossils, and we have no certain knowledge of the external appearance of these mammals, drawing conclusions as to what they looked like alive only by analogy. For purposes of classification, most external data are of importance only in separating species and subspecies, since the truly fundamental characters of relationship are to be found under the hair and skin. The general scheme of this classification is to start with the large groups of mammals all possessing certain important characters. These large groups are in turn split up into smaller groups on the basis of common characters within each smaller group and certain differences in structure which distinguish one group from all the other groups. By a series of such reductions of the larger groups, eventually the scheme arrives at a very small group, which includes only one unit, the species or subspecies, as the case may be, which differs in some character or characters from all the other unit groups, but is related through the larger groupings to many other mammals.

We have then the largest group within the Animal Kingdom, which includes all the mammals and excludes all other quadrupeds, and this is called the Class Mammalia. For the sake of example, let us start down through the lesser groups toward some particular species, the Star-nosed Mole, and we encounter successively the Subclass Eutheria (all the mammals except the Monotremes or egg-laying mammals), the Order Insectivora (mammals of small size, primitive structure, and special-

ization for an insect diet), the Family *Talpidae* (all the Moles), the Genus *Condylura* (Moles with highly-developed, fleshy fringe about end of muzzle), and the Species *cristata* (the Star-nosed Mole). Thus, step by step, the system has ruled out the mammals which bear a remote relationship to the Star-nosed Mole, while preserving at the same time the ties of close relationship, and a definite position has been created for the one species of Mole which differs from all the other Moles and yet is a true Mole, an insectivore, a viviparous mammal, and a mammal in the largest and most inclusive sense. When we write the scientific name for the Star-nosed Mole we use only the genus and species name, thus—*Condylura cristata*—and all of the rest of it is understood, if we follow the generally accepted classification.

If there were several creatures, all obviously Star-nosed Moles, but differing from one another by some comparatively trivial character such as color of pelage or difference in size, then, in order to indicate just which one of these particular varieties we had in mind it would be necessary to add some thing to our two-word name, *Condylura cristata*, and split up the species into subspecies, forming a name such as *Condylura cristata alpha* or *Condylura cristata beta*, or what-not, depending upon what name the describer of the subspecies selects.

At the end of the scientific name of the mammal the name of the describer or author of the name is written. If the author's name is placed within parentheses it indicates a change from the original form in which the scientific name was written.

The old criterion of a species was its inability to cross or hybridize successfully with other closely related members of the same large group. Proof of successful mating indicated that the parents were of the same species. This test is still accepted as one of the best checks against the naming of too many species. On the other hand, the recognition of subspecies implies that the particular variety designated by the third term in the name does successfully cross with other individuals which have the common characters indicated by the second term of the name. To illustrate—the Eastern Chipmunk is *Tamias striatus* which is recognized to occur as five different subspecies. The typical form is *Tamias striatus striatus*, the term *striatus* being repeated in the name to show

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that this particular subspecies or variety served as the type for the species. *Tamias striatus fisheri* is a variety which differs slightly from typical *striatus* but is so closely related to it that it interbreeds with it and we find examples where the ranges of the two forms meet which are just as much typical *striatus* as they are *fisheri*. This intergrading may extend through a chain of several subspecies where subspecies A intergrades with B, B with C, C with D, et cetera. Although the geographical range of subspecies A may not touch that of subspecies D, so that A and D never actually intergrade directly, nevertheless the subspecific relationship is well shown by the intermediate members of the series and A, B, C, and D are all to be considered as subspecies of the same species.

VARIABILITY OF MAMMALS

Mammals vary in size, coloration, and proportion of parts. This variation is usually within close limits, but sometimes variation in color may cover a wide range. The descriptions in this field book are intended to apply, as far as possible, to the average individual of any given species and the measurements, colors, etc., must not be regarded as narrowly restrictive. Individuals may vary as much as ten per cent or more in size, from the figures given, and when identifying a mammal due consideration must be made for individual variation. Attention is generally directed to the most variable characters, in the synopsis.

LIFE-HISTORIES OF MAMMALS

The study of the life-histories of mammals is a fascinating subject and one that is by no means exhausted. While we know many interesting facts about the behavior of mammals, there are many details which we can only suspect, and probably as many more of which we do not even have a suspicion. Nor does one need to go to a far frontier to look for these facts; some of our commonest mammals are today only superficially known. The Mole, secreted in its subterranean fortress, the Shrew, favored by small size and undercover activity, the Flying Squirrel, coming forth only at night, and many other nocturnal wanderers have successfully concealed many intimate details of behavior. Bats are an enigma

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well worth the solving, with their mastery of flight, their possession (?) of a sixth sense, and their super-organization of the nervous system. The great waves of rodent increase which come in cycles in Rabbits and Meadow Mice or Lemmings present unusual opportunities for observation.

Hunters and sportsmen learn many facts of life-history in looking for game and because of this we know more today about some of the large mammals than we do of the much more abundant, small mammals. It can not be too strongly recommended that persons who are out-of-doors, with opportunities for observation, keep a journal or record of what they see of mammal behavior. Not only will this practice give direction and purpose to what may otherwise be random study, but it will make natural history all the more fascinating and may supply some new and valuable data.

LIFE ZONES

It will be noted that there are frequent references to "Life Zones" in the geographical ranges in this field book. These are the "Zones" used so extensively by the U. S. Biological Survey. They are based upon the studies of Dr. C. H. Merriam and others of the Survey and were set forth in their earliest form by Dr. J. A. Allen, in 1871. Lack of space prevents more than a passing reference to this scheme, but several titles are mentioned in the bibliography at the close of the book for the readers who are unfamiliar with these useful terms.

HOW TO USE THIS FIELD BOOK

How may one study mammals and what is the best way to use this field book? Assuming that the observer is within a short distance of wild land or areas where dwellings are far enough apart to permit wild creatures to live in the meadows, brushy areas, or forests in between, the only requisites are good eyes and ears and a fair amount of patience. Even about our large cities there are many tracts of land where mammals live in their wild and unmolested state, and practically everywhere away from the cities a fairly extensive mammal population may be found if one knows how and where to seek it.

The average person may not wish to capture or disturb the mammals he is observing and in that event he must depend upon what long range observation will give him. In the case of some mammals, such as the Squirrels and most of the larger mammals which he may be fortunate enough to see, there should be little difficulty in identification. The markings, size, and form of these mammals are so distinctive that usually there will be little doubt as to which large, general group the mammal belongs. That is to say, one will recognize that he is looking at some species of Squirrel, Weasel, Rabbit, Fox, Deer, et cetera, and the additional information to seek will be the particular one of the group he has noted. Is it a Red Squirrel, a Gray Squirrel, or a Fox Squirrel; a Varying Hare or a Cottontail; a Red Fox or a Gray Fox? By consulting the field book and looking over the particular genus involved, the identification is carried out still farther, and by noting from the geographical ranges just what form should be found in the region in question, the student can then check over the brief synopsis of that form to learn whether it describes his mammal or not. If the description does not fit, then try descriptions of the other forms whose geographical ranges would be most likely to bring them into the territory.

But for nocturnal mammals or those of secretive habits, it will be necessary to use traps in order to gain first-hand acquaintance. These traps may be of the type that takes

mammals alive or, if a study specimen for the collector's cabinet is desired, the traps may be of the ordinary Newhouse pattern or the common, spring mouse-trap. Since we have so many details yet to learn about the daily habits and home life of mammals, there is much to commend capturing them alive and keeping them in comfortable cages under observation. Most small mammals tame readily and are easily cared for, and especially is this true of the rodents.

Although it is not very difficult to find the evidence that small rodents are present in a given locality, it is not often that one can catch more than a glimpse of the creatures themselves, and then they are apt to be alarmed and soon pass from observation. Meadow Mice, White-footed Mice, Pocket Mice, Jumping Mice, etc., may be fairly abundant in a region and yet so seldom seen that trapping is the only recourse. The best trap for these small mammals is a box-trap, and for bait many things may be used,—apple, raisin, grain, bread, bacon, and so forth; most small mammals are unsuspecting and enter traps freely.

To gain a complete idea of the mammals of a locality it will be necessary to set out traps for dead specimens and to skin and make up the mammals into so-called "study specimens." These are then studied and identified from descriptions in books and by direct comparisons with specimens in the large museums. One soon gains the knack of preparing these study specimens and the building up and serious study of a mammal collection is well worth the time devoted to it. The sentimental reluctance one naturally feels at killing these wild creatures may be set at rest by the realization that the forces of the wild environment and the stupendous sacrifice of life exacted every twenty-four hours by Dame Nature herself make the activity of the collector a very trivial consideration; and it is better to devote a few specimens to a serious and lasting purpose than to forego the capture and surrender the victim to a Snake, Hawk, Weasel or predatory House-cat. The collector is usually the least of all the many enemies a mammal may have.

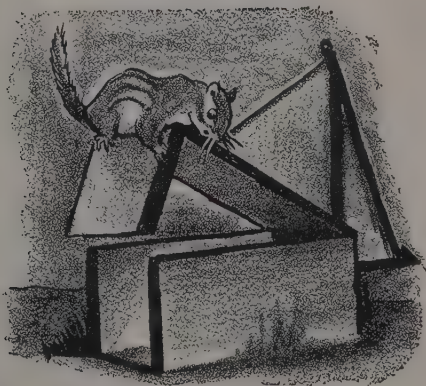
A small, compact set of instructions on the *Capture and Preservation of Small Mammals for Study* is published by the American Museum of Natural History, *Guide Leaflet No. 61*, and is sold at fifteen cents a copy. The United States

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National Museum has published a short account, *Directions for Preparing Specimens of Mammals*, by Gerrit S. Miller, Jr., which has gone through several editions.

Briefly set forth, the purpose of a study skin is to show the animal in a compact form which can be easily preserved and stored. The small species, Mice, Rats, Squirrels, etc., are skinned, poisoned with arsenic and alum on the flesh side of the skin and then filled out with tow or cotton to somewhat the original size. The stuffed skin is dried, with body, legs, and tail straight, and if the specimen is stored away from moths and bright sunlight, it will remain as a permanent and faithful record for a great many years, probably several centuries. It is well to adopt a standardized procedure in the preparation of skins, since then comparisons may be made without undue allowance for such man-made characters as over or under-stuffing, distorted limbs, etc.

Traps may be set in the places most likely to be frequented by the mammals desired; in this field book the favorite haunts for each type of mammal are given, as well as the food of that species, and this data will be of service to the collector.



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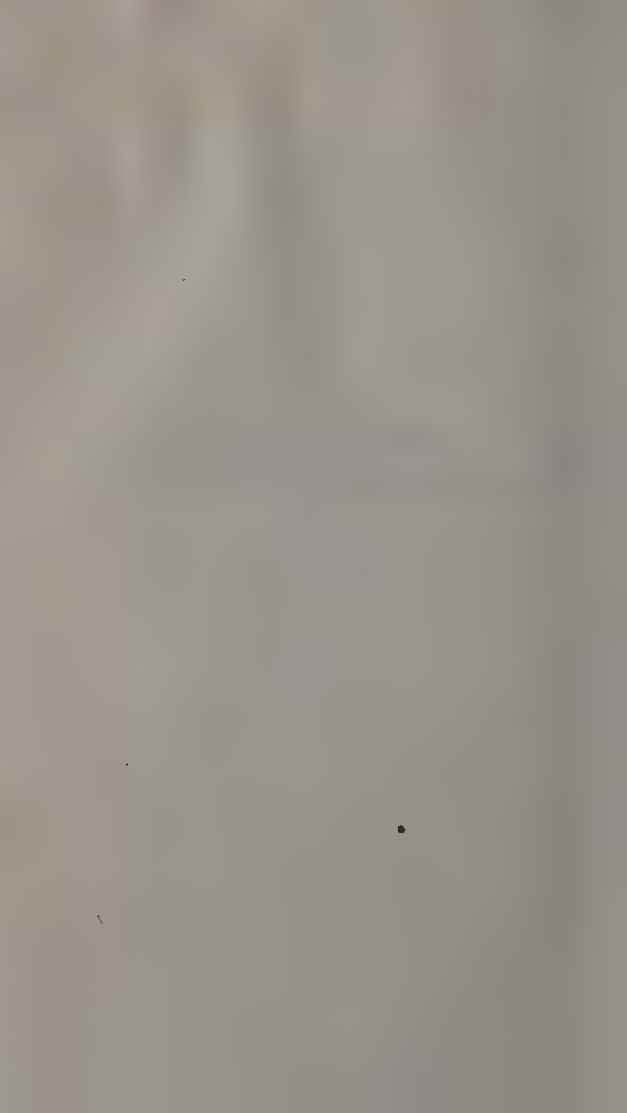
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FIELD BOOK OF
NORTH AMERICAN MAMMALS



Class MAMMALIA

See definition of the class, on page xi.

Subclass EUTHERIA

All mammals exclusive of the Monotremes.

Order MARSUPIALIA. MARSUPIALS

Mammals of small to large size, the young of which are born at a very incomplete stage of development and are usually carried by the mother in an external abdominal pouch. In some members of the order the pouch is rudimentary or even absent, but in the species found in the United States it is well developed. Brain of a low order; a true allantoic placenta rarely present (never in American forms); clavicle present; mammae always abdominal; teeth numerous and primitive in character; diet varied; habit arboreal, terrestrial, aquatic or fossorial.



FIG. 1. Opossum

Family **Didelphiidæ**. Opossums

Small to medium-sized marsupials with five toes on fore and hind feet; tail usually long and prehensile; teeth fifty in number; diet omnivorous, insectivorous, and carnivorous.

Genus **Didelphis**

Dentition: Incisors, $\frac{5}{4}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{4}{4}$ = 50

Opossum.—**Didelphis virginiana**

and related forms

Names.—Opossum; Common Opossum; Eastern Opossum; Virginia Opossum. Plate II.

General Description.—A marsupial mammal with body about the size of a House Cat, long naked tail, large naked ears, long fur, grizzled gray in color.

Head long, with slender muzzle; ears prominent; tail prehensile; marsupial pouch present; forefeet with five toes, each toe with a nail; hind feet with five toes, the first toe large, nailless and opposable; soles naked; pelage composed of very long external hairs and short, soft underfur; terrestrial and arboreal in habit.

Color.—Adults: Sexes alike in color; no marked seasonal variation.

Upperparts.—Long, outer fur a mixture of coarse black and white hairs to give a grizzled appearance, the white hairs very long and exceeding the black in length; head whitish to yellowish; cheeks whitish; black or sooty about top of head and eyes; ears with yellow spot on upper edge, otherwise black.

Underparts.—A mixture of dark hairs and white hairs, the black predominating to give dusky appearance; legs and feet dusky; tail with long body hair running down a short distance at base, the naked, scaly portion black at the base, then yellowish white for rest of its length. Marsupial pouch, found on females, a fur-lined opening along lower abdomen.

Young.—Colors not as contrasting as in adults, general appearance lighter.

Measurements.—Total length, 33 inches; tail vertebræ, 12.5 inches; hind foot, 3 inches.

Geographical Distribution.—From New York to Florida, and from Atlantic Coast to the Great Lakes and Texas.



FIG. 2. Feet of Opossum; forefoot above, hind foot below

Food.—Omnivorous, but feeding largely on animal life such as small birds, mammals, frogs, fish, eggs, and insects, and on fruit.

Enemies.—Great Horned Owls; Wildcats; Foxes; Coyotes; Wolves; Cougars; and Bears.

Species and Subspecies of the Genus *Didelphis*

Virginia Opossum.—*Didelphis virginiana virginiana* Kerr.

The animal of the above description, ranging from the Hudson valley to northern Texas and almost to the Gulf Coast, west to the Great Lakes.

Florida Opossum.—*Didelphis virginiana pigra* Bangs.

Smaller, darker, and longer tailed. Total length, 31 inches; tail vertebræ, 14 inches; hind foot, 2.7 inches. Known to occur in Florida, the lower coast region of Georgia, and throughout the low Gulf Coast belt to western Louisiana.

Texas Opossum.—*Didelphis mesamericana texensis* (Allen).

A large Opossum occurring in two color phases, a gray phase quite similar in appearance to the Virginia Opossum, and a

black phase in which the long outer hairs are black instead of white. Top of head to nose dusky; dusky stripe from ear through eye to nose; tail black for basal half, rest flesh color. Total length, 31 inches; tail vertebræ, 15 inches; hind foot, 2.7 inches. Ranges from coast region of Texas southward, from Nueces Bay and the Lower Rio Grande Valley.

* * * * *

The Virginia Opossum and its relatives, the Texas Opossum and the Florida Opossum, are the only North American representatives of a very ancient order, the Marsupialia, most widely represented today in Australia. The Opossums are a large family—the Didelphiidæ—and range from eastern North America south throughout Central and South America, where the group has become highly differentiated into many genera and a host of species. The species of the genus *Didelphis* are the largest mammals of the family, and the Virginia Opossum is about as large as any species of the genus. *Didelphis* is the only genus of North American mammals the members of which have abdominal pouches in which the young are carried.

The Opossum is extremely adaptable to the conditions of its environment. Although the hind feet, with grasping great toes, and the prehensile tail are arboreal specializations, the Opossum is perfectly at home on the ground and may wander considerable distance in search of food without taking to the trees.

When cornered by an enemy, this mammal appears to die or to feign death, whence the expression "playing 'possum." On the basis of careful observation, it would seem that this apparently lifeless condition is brought about by a nervous shock beyond the control of the animal, and observers have noted such a lowering of the vital forces, pulse, heart-beat, etc., that they believe the Opossum has "fainted" and is not shamming. On the other hand, the recovery from the lifeless state is rapid enough to hint that the Opossum knows what is going on and is ready to take advantage of any opening for escape.

The Opossum does a little damage when it can get to eggs or poultry, but of recent years has attained a value as a furbearer that much more than offsets this. It is also a game mammal of prominence in certain sections of the country and is eagerly hunted for the table.

The young Opossums are very tiny when born and are considerably less developed than the young of other mammals,

MURINE OPOSSUM

being still in the embryonic stage. Opossums are very prolific and have from five to fourteen young at a birth. While very small they remain attached to the teats in the abdominal pouch and are carried about by the mother.

Opossums are very hardy and tenacious of life. It is due to this fact, perhaps, that the animal has been able to hold its own so successfully, because it is rather slow and stupid in comparison with most other mammals.

Genus *Marmosa*

Dentition: Incisors, $\frac{5}{4}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{4}{4}$ = 50.

Murine Opossum; Mouse Opossum

This genus is not found native in the territory included in the scope of this volume, but it is not infrequently brought into seaports on steamers, especially by fruit steamers where it is brought aboard hidden in bunches of bananas.

The Murine Opossums are all much smaller than members of the genus *Didelphis*, and most of them are truly of mouse size, hence the name. The species most apt to be encountered as strays come from Central America and are soft-furred, yellow or brownish in color, with long, naked prehensile tails, large eyes, and broad hands and feet. The females have no external abdominal pouches as in the genus *Didelphis*. If the specimen hailed from Panama it is apt to be *Marmosa isthmica*, while *Marmosa zeledoni* is a species in Costa Rica. Females of *isthmica* average, total length, 12.5 inches; tail, 7 inches; males, total length, 15 inches; tail, 8 inches. *Marmosa zeledoni* is a trifle smaller than *isthmica*.



Order INSECTIVORA

Mammals of small size, primitive dental characters, insectivorous diet, and presenting many specializations in the various families of the Order. Only two families of the Insectivora are found in North America, the Talpidæ and the Soricidæ, widely differing from one another in many respects, but having the following characters in common: snout long and mobile; eyes small or hidden; ears minute; head elongate; feet with five claw-bearing toes; plantigrade or subplantigrade in gait; clavicles present; musk glands present; manner active and nervous.

Family Talpidæ. Moles¹

Insectivorous mammals of small size, adapted for a subterranean habitat, with highly specialized forelimbs; soft, velvet-like fur; long, pig-like snout; minute eyes; very short neck; and strictly insectivorous or carnivorous diet.

Subfamily Scalopinæ

Genus *Scalopus*

Functional dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 36.

Common Mole.—*Scalopus aquaticus*

and related forms

Names.—Common Mole; Eastern Mole. Plate III.

General Description.—A small, sturdy mammal with greatly enlarged forefeet; soft, velvety fur; naked tail; eyes and ears so minute as to escape superficial observation; seldom seen above ground, and generally known to be present only through the raised ridges and mounds of earth pushed up from below. Males somewhat larger than females.

Color.—Sexes indistinguishable as to color.

¹ For the most recent and complete review of the American Moles, see H. H. T. Jackson, *North American Fauna*, No. 38, 1915.

MOLE

Upperparts.—The soft, close fur, resembling velvet in that it has no "set" and may be brushed either backward or forward, is blackish brown in color, varying in different lights from brownish to silvery gray; muzzle naked; feet and tail



FIG. 3. Common Mole

whitish; tail thick and practically naked; fur neutral gray at base.

Underparts.—Slightly paler than above, and usually tinged with brown on chest.

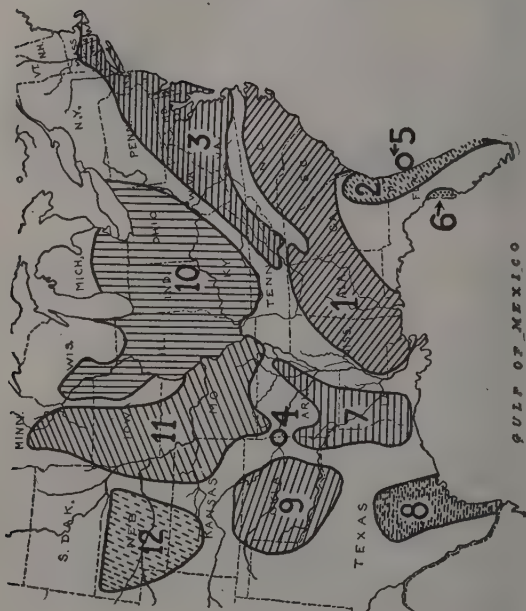
Young.—The young, which are very seldom seen in the early stages, soon take on the appearance of the adults, but while real small are grayer than adults.

In summer, specimens are somewhat paler than in winter. The molt follows a definite sequence, the fresh pelage coming in first on the breast and abdomen, and gradually replaces the worn pelage below. Above, the new fur appears first posteriorly and works forward. The chin and throat usually retain the old pelage longest. As a rule the line of demarcation between fresh and worn pelage is quite obvious.

Measurements.—Total length, males, 7.2 inches, females,

FIG. 4. Distribution of the species and subspecies of *Scalopus* north of Mexico, after Jackson

1. *Scalopus aquaticus howelli*
2. *Scalopus aquaticus australis*
3. *Scalopus aquaticus aquaticus*
4. *Scalopus areus*
5. *Scalopus aquaticus anastasa*
6. *Scalopus aquaticus parvus*
7. *Scalopus aquaticus pulcher*
8. *Scalopus aquaticus texanus*
9. *Scalopus aquaticus intermedius*
10. *Scalopus aquaticus machrinus*
11. *Scalopus aquaticus machrinoides*
12. *Scalopus aquaticus caryi*



6.5 inches; length of tail, males, 1.2 inches, females, .9 inch; length of hind foot, males, .8 inch, females, .8 inch.

Geographical Distribution.—Eastern North America.

Food.—Strictly animal in nature, insects of various kinds,—beetles, larvæ, angle-worms, Meadow Mice.

Species and Subspecies of the Genus *Scalopus*

Eastern Mole.—*Scalopus aquaticus aquaticus* (Linnæus).

As described above; the darkest form of the genus (in full winter pelage). Found in "Eastern United States from eastern and southern Massachusetts, southeastern New York, and southeastern Pennsylvania, south through Virginia, and in the Appalachian Mountains south through western North Carolina and eastern Tennessee." (Jackson)

Howell Mole.—*Scalopus aquaticus howelli* Jackson.

Paler than typical *aquaticus* and smaller; total length, males, 6 inches. Found in "North Carolina (except in Appalachian Mountains), South Carolina, northern Georgia, thence southwest across central Alabama and southern Mississippi to Pensacola Bay and the Mississippi River." (Jackson)

Florida Mole.—*Scalopus aquaticus australis* Chapman.

Smaller than *howelli*, with relatively short, broad, high skull; upperparts (winter) clove-brown to dark fuscous; total length, males, 5.8–6 inches, females, 5.6 inches. Found in "Southeastern Georgia and the eastern portion of peninsular Florida south to Lemon City." (Jackson)

Anastasia Island Mole.—*Scalopus aquaticus anastasæ* (Bangs).

Size of *australis* but above golden sepia in winter pelage, with bright orange coloration on face, chin, and wrists. Found only on Anastasia Island, Florida.

Little Mole.—*Scalopus aquaticus parvus* (Rhoads).

Smallest form of the genus, colored like *australis*, with shorter tail; total length, males, 5.4 inches. Found in "Region north of Tampa Bay, in Hillsboro and Pasco Counties, Florida." (Jackson)

Prairie Mole.—*Scalopus aquaticus machrinus* (Rafinesque).

The largest form of the genus (total length of males, 8 inches); paler than typical *aquaticus* and usually more reddish brown. Found in "Eastern Iowa, and east of the Mississippi River west of the Appalachian Mountains from western Wisconsin, northern Illinois, southern Michigan, southwestern Ontario (Point Pelee), and northern Ohio, south to central Tennessee." (Jackson)

Missouri Valley Mole.—*Scalopus aquaticus machrinoides* Jackson.

Size large, exceeded only by *machrinus*; total length, males, 7 inches; color grayer than *machrinus*, in winter clove-brown above, in summer light drab. Found "West of the Mississippi River, except eastern Iowa, from central

Minnesota, southeastern South Dakota, and the eastern border of Nebraska, south through northeastern Kansas to extreme northern Arkansas." (Jackson)

Arkansas Mole.—*Scalopus aquaticus pulcher* Jackson.

Size of typical *aquaticus* but with larger hind foot and larger skull; winter pelage dark fuscous above, with gray-tipped hairs. Found in "Humid lowland region of southern and eastern Arkansas, southeastern Oklahoma, northwestern and central Louisiana, and eastern Texas." (Jackson)

Northern Plains Mole.—*Scalopus aquaticus caryi* Jackson.

In color, the palest form of the genus, size medium; total length, males, 6.4 inches. Color, autumn pelage, above, light drab, paler on head. Found in "Arid and semiarid plains region of central and western Nebraska, northeastern Colorado, and northwestern Kansas." (Jackson)

Southern Plains Mole.—*Scalopus aquaticus intermedius* (Elliot).

Most like *caryi* but darker and more ochraceous; color, in winter, above, light drab tinged with buff pink; nose and wrists ochraceous-buff to zinc-orange; total length, males, 6.6 inches. Found in "Central and western Oklahoma and adjacent parts of northern Texas." (Jackson)

Texas Mole.—*Scalopus aquaticus texanus* (Allen).

Small in size, total length, males, 5.6 inches; color, winter, brownish with bronze tinge. Found in "Coast region of Texas from Matagorda Bay to Cameron County, north in the interior to central and east-central Texas." (Jackson)

Coppery Mole.—*Scalopus æreus* (Bangs).

Distinguished by rich coppery brown pelage; total length, females, 6.1 inches. Very rare, known only from the type specimen. Found only at Stilwell, Adair County, Oklahoma.

* * * * *

The Eastern Mole has habits very similar to those of the Western Mole (see page 17), but does not throw out such large mounds of earth. It is very seldom seen out of the burrow and is most commonly encountered in loose loam or easily moved soil where food is plentiful. It makes a nest about six inches in diameter, lined with small roots, grass, or leaves, and from a foot to a foot and a half below the surface of the ground. The young, from two to five, are born in March or April.

Genus *Scapanus*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{3}{3}$ = 44.

Western Mole.—*Scapanus townsendi*

and related forms

General Description.—General form much like that of Common Mole, genus *Scalopus*, but tail thicker, and with more teeth (compare dental formulæ); fore toes and hind toes not webbed as in *Scalopus*, hands as broad as long, (in *Scalopus* broader than long).

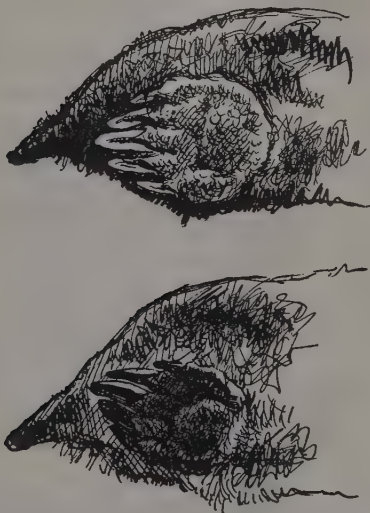


FIG. 5. Forefoot of Eastern Mole (*Scalopus*) above, compared with forefoot of Western Mole (*Scapanus*)

Color.—Sexes indistinguishable as to color; some seasonal variation.

Winter.—Upperparts dark, varying from blackish brown to almost black, generally showing purplish high-lights; underparts only slightly paler than above and generally tinged with brown.

Summer.—Slightly paler than winter, with more pronounced purplish sheen.

Young.—Paler and more silvery than adults.

Measurements.—Total length, males, 9 inches, females, 8.2 inches; tail vertebræ, males, 1.6 inches, females, 1.8 inches; hind foot, males, 1.08 inches, females, 1.07 inches.

Geographical Distribution.—Western California, Oregon, and Washington.

Food.—Insect and animal food, angle-worms, larvæ of beetles, and occasionally Mice.

Species and Subspecies of the Genus *Scapanus*

Oregon Mole; Townsend Mole.—*Scapanus townsendi* (Bachman). Plate III.

As just described; the largest species of the genus. Found in "Extreme northwestern California, Oregon, and Washington west of the Cascade Mountains." (Jackson)

Coast Mole.—*Scapanus orarius orarius* True.

Noticeably smaller than *townsendi* (total length, males, 6.8 inches); dark and similar in color to *townsendi*, with relatively smaller feet and claws. Found in "Humid coast region of northern California (north of Mendocino), Oregon, and Washington." (Jackson)

Scheffer Mole.—*Scapanus orarius schefferi* Jackson.

Similar to typical *orarius* but paler; total length, males, 6.8 inches; slightly larger feet and claws; color, autumn pelage glossy, deep mouse-gray above. Found in "Extreme southwestern British Columbia, northwestern Washington (east of Puget Sound and north of latitude 48° N.), central and southern Washington from the west slopes of the Cascade Mountains east to Walla Walla, and both slopes of the Cascade Mountains in northern and east-central Oregon." (Jackson)

California Mole.—*Scapanus latimanus latimanus* (Bachman).

Size medium; total length, males, 6.8 to 7.2 inches; color, winter, above, fuscous black. Distinguished from *townsendi* by smaller size, and from *orarius* by its wider, heavier skull, larger teeth, and other cranial details. Found in "Western California west of the San Jacinto and Sacramento Valleys, from Santa Maria River north to Cape Mendocino, thence northeasterly to Klamath Canyon, Siskiyou County." (Jackson)

San Joaquin Mole.—*Scapanus latimanus campi* Grinnell and Storer.

Resembling typical *latimanus* "but smaller, pelage much paler and browner, feet and claws smaller," like *occultus* "in color, but decidedly larger in size, especially as regards

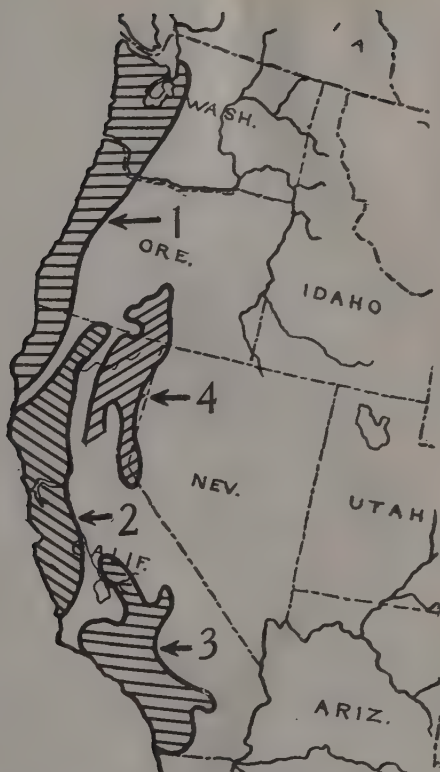


FIG. 6. Distribution of *Scapanus townsendi* and the more widely ranging forms of *Scapanus latimanus*, after Jackson

1. *Scapanus townsendi*
2. *Scapanus latimanus latimanus*
3. *Scapanus latimanus occultus*
4. *Scapanus latimanus dilatus*

feet and claws." Total length, males, 6.8 inches; tail vertebræ, 1.5 inches; hind foot, .88 inch. Found in "river-bottom lands of the San Joaquin Valley (California) generally, at least on the east side." (Grinnell and Storer)

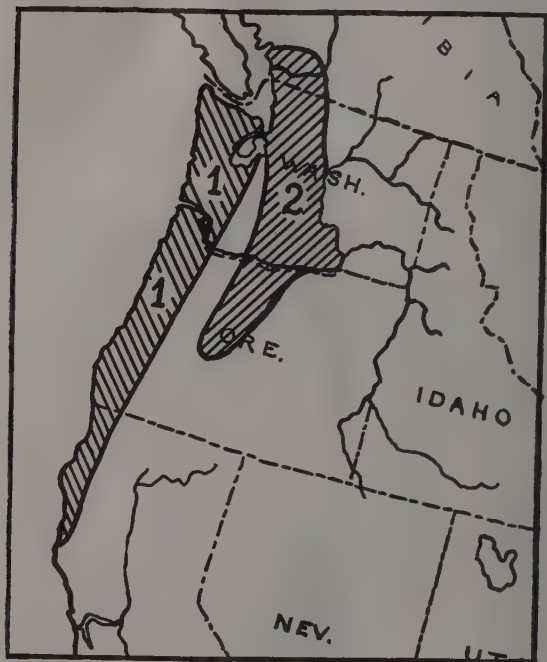


FIG. 7. Distribution of the subspecies of *Scapanus orarius*, after Jackson

1. *Scapanus orarius orarius*
2. *Scapanus orarius schefferi*

Southern California Mole.—*Scapanus latimanus occultus* Grinnell and Swarth.

Smaller than typical *latimanus*; total length, males, 6 inches; paler and browner in color. Found in "Southern California west of the deserts, from Olancho, at the south end of Owens Lake, in Inyo County; Sanger, in Fresno County; and

MOLE

Santa Barbara, in Santa Barbara County, south to the San Diegoan region." (Jackson)

Grinnell Mole.—*Scapanus latimanus grinnelli* Jackson.

Darkest in color of the *latimanus* group, size small, total length, males, 6.2 inches. Known only from Independence, Inyo County, California.

Mono Mole.—*Scapanus latimanus monoensis* Grinnell.

Resembling *grinnelli* "but color mouse-gray instead of fuscous black, and size slightly less." (Grinnell.) Total length, 6 inches; tail vertebrae, 1.3 inches; hind foot, .82 inch. Found in Mono County, California.

Yosemite Mole.—*Scapanus latimanus sericatus* Jackson.

Smaller than typical *latimanus*, darker and more grayish in color; total length, females, 6.6 inches. Found in Yosemite region, Mariposa County, California.

Sierra Mole.—*Scapanus latimanus minusculus* (Bangs).

Similar to *occultus* in size and color, but differing in cranial characters, skull higher and narrower. Known only from Fyffe, El Dorado County, California.

Klamath Mole.—*Scapanus latimanus dilatus* (True).

Paler and slightly smaller than typical *latimanus*, with shorter, higher, and rounder skull. Total length, males, 6.8 inches; color, summer, mouse-gray above. Found in "South-central Oregon and Upper Sonoran and Transition Zones of northeastern California and adjacent parts of Nevada." (Jackson)

Mount Mazama Mole.—*Scapanus latimanus alpinus* (Merriam).

Color of *dilatus* and size of large specimens of typical *latimanus*. Total length, males, 7.5 inches; color, worn summer pelage, above, mouse-gray. Known only from Crater Lake, Mount Mazama, Klamath County, Oregon.

* * * * *

In spite of the fact that Moles may be quite common in the regions where they occur, they are very seldom seen. The average person sees a Mole only when in a trap and knows the creature best from the visible evidences of its presence, the long, raised ridges of earth and the piles of loose soil pushed up from below.

The householder calls down curses upon the Mole whenever one crosses his lawn and imagines that this animal does far more damage than is actually the case. It is true that the ridges and mounds are unsightly objects on a well-kept lawn, and it is also true that where the sod has been raised and the grass-roots have dried out that dry, yellow grass may appear, but it is a mistaken conception to suppose that the Mole is feeding on the grass or any other plant food in the yard.

The Mole is after worms and other insect food, and starves to death if forced to a plant diet. Sometimes Meadow Mice follow the runways of the Mole to take advantage of any exposed roots and then, of course, it is only natural that the Mole is blamed for the damage.

Moles are active creatures and in favorable soil make an extensive series of runways. Some of these runways may not be used more than once and the animal may not traverse them again after they are made, others may be used several times in twenty-four hours. If all the ridges are pressed down with the foot a later visit will show which ones are raised and in use.

The Mole has a central nest-chamber or retreat, deep under a stump, stone-wall, or other surface obstacle and from this it works as a base, pushing out for considerable distances. Most frequently the runway passes so close to the surface of the earth that the roof of the tunnel is raised above the ground-level; but sometimes this is not the case and the Mole must get rid of loose earth in another fashion. From deep tunnels the loosened earth is pushed up a short, vertical chimney and piles up on the surface as a mound. Moles are surprisingly strong and literally swim through the soil.

The powerful forefeet thrust out sideways to displace the earth, and if the soil is mellow the progress is fairly rapid. I have stood and watched the large Townsend Mole at work just below the surface of a meadow. The soil heaved and lifted and the sound of cracking grass-roots was clearly audible for several feet. Occasionally the shifting of the sod disturbed an angle-worm which began to draw itself up out of the earth, but presently there would come a subterranean turmoil and the worm would be jerked back into the ground and I knew that the Mole had pulled it down. From observations on Moles in captivity, it has been noted that the snout plays an important part, being thrust ahead to make the preliminary opening, when one forefoot follows and sweeps outward to enlarge the tunnel.

The head of the Mole is set so close to the shoulders that there is almost no neck, and the head and shoulders are capable of a powerful upward thrust. For this reason it is doubtless easier for the Mole to drive its tunnel just under the surface where part of the runway can be broken upward into the air.

The tail is a sensitive, tactile organ and serves to guide the animal when it moves backwards along a runway. The fact that the fur strokes as easily one way as the other would also favor progression in either direction.

It is not difficult to detect Moles at work. If the observer treads softly and avoids jarring the earth, it is possible to approach very close to the heaving sod which shows where this subterranean hunter is active. Jarring the ground warns the Mole and it loses no time in retreating. When the animal is working near the surface it is a fairly easy matter to approach with a shovel, and after giving the moving area a smart rap, to thrust the blade down under the Mole and throw out the

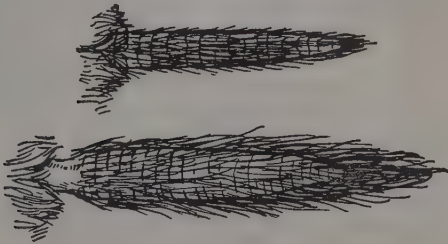


FIG. 8. Tail of Common Mole (above) compared with tail of Hairy-tailed Mole

stunned animal. This is often simpler than trying to trap the Mole, for it pushes so much earth along that the trap is sprung before the creature reaches the danger zone.

Apparently young Moles do not leave the deep, underground nest until nearly full grown, because the Moles caught in traps are never very young animals. About the only way to get the young is to dig out the nest, and it was not until the American Museum had sent notices all over the country that they could secure young animals for a group. The farmer's plow occasionally turns out a nest of young Moles, but it is an exceptional circumstance to encounter the immature of this common mammal.

In the spring, Moles sometimes become exceedingly active and push out runways much longer than usual, even breaking out onto the surface and wading about for a distance above the

ground. This is probably in search of a mate, for Moles are apparently solitary creatures during most of the year and seldom more than one in a series of runways.

Moles probably have only one litter of young a year, the usual number being four, born in April or May.

Genus *Parascalops*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{3}{3} = 44$.

Hairy-tailed Mole.—*Parascalops breweri*

Names.—Hairy-tailed Mole; Brewer Mole. Plate III.

General Description.—Similar in general appearance to the eastern Mole, *Scalopus aquaticus*, but with hairy tail, constricted at base; snout shorter, with median longitudinal groove above, and nostrils lateral, crescentic; toes not webbed; hands as broad as long; fur soft, but coarser than in *Scalopus* and *Scapanus*.

Color.—Sexes indistinguishable as to color.

Upperparts varying from fuscous-black to blackish, with browner hairs on nose and tail, which may be white in old specimens; underparts paler and grayer than above, sometimes with brownish tinge on throat and underparts.

Measurements.—Total length, males, 6 inches, females, 6; tail vertebræ, males, 1.2 inches, females, 1.2; hind foot, males, .8 inch, females, .75 inch.

Geographical Distribution.—"Southeastern Canada and northeastern United States from southern New Brunswick, southern Quebec, and eastern Ontario, south to northeastern Ohio and southern Pennsylvania, and in the Appalachian Mountains to western North Carolina." (Jackson)

Food.—Insects of different kinds, earthworms, grubs, etc.

Species of the Genus *Parascalops*.

Hairy-tailed Mole.—*Parascalops breweri* (Bachman).

As described above; no other forms of the genus known.

* * * * *

Although the Hairy-tailed Mole is found over a fairly extensive area, it appears to be only locally common and less

STAR-NOSED MOLE



FIG. 9. Distribution of *Parascalops breweri*, after Jackson is known about its habits than those of *Scalopus* or *Scapanus*. In general, the behavior of this Mole is much like that of the Eastern Mole.

Subfamily Condylurinae

Genus Condylura

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{3}{3}$ = 44.

Star-nosed Mole.—*Condylura cristata*

General Description.—Form, in general, like that of *Scalopus*, the Common Mole, but having a peculiarly deve-

loped snout which terminates in a fringe of twenty-two fleshy processes forming a wide, naked nasal disk. These processes are symmetrically arranged eleven on each side of a median line. Eyes small, but larger than in *Scalopus*, *Scapanus*, or *Parascalops*; legs short and weaker than in these genera; forefeet hand-like, palm as broad as long, with first four toes having three flat, triangular processes on the lower side of

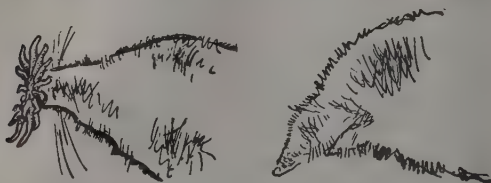


FIG. 10. Head of Star-nosed Mole (left) compared with head of Eastern Mole

their outer edges; toes not webbed; tail relatively long, slender in summer, but greatly enlarged and thickened in winter, covered with coarse, black hairs; fur dense and silky, but coarser than that of *Scalopus*, *Scapanus*, and *Parascalops*.

Color.—Sexes colored alike.

Upperparts blackish brown to blackish; underparts browner and paler than above, underside of tail sometimes noticeably lighter than upperside.

Worn pelage paler and browner than pelage just described, with frequently a buffy or yellowish ring about wrists.

In living animals the nasal disk is rose-colored

Young animals paler and browner than adults.

Measurements.—Males, total length, 8 inches; tail vertebræ, 3.2 inches; hind foot, 1.1 inches.

Geographical Distribution.—"Southeastern Canada and northeastern United States, from southern Labrador, central Quebec and Ontario, and southeastern Manitoba, south to northeastern Illinois and northern Indiana and Ohio; in the Atlantic coast region south to Virginia (Dismal Swamp) and Georgia (Marlow); and in the Appalachian Mountains to western North Carolina." (Jackson)

Food. Same as that of other Moles, insectivorous.

SHREW MOLE

Species of the Genus *Condylura*.

Star-nosed Mole.—*Condylura cristata* (Linnæus). Plate III.

As described, no other forms of the genus known.

* * * * *

The Star-nosed Mole is the most distinctive in appearance of the American Moles, the peculiar, fleshy nasal fringe serving to identify the animal immediately.

Although this Mole makes subterranean burrows very similar to those of the Eastern Mole, they are more irregular in their course and are more crooked. The surface ridges appear and disappear more often and the tunnels may open out to the surface and continue as runways through the grass or under the leaves. In winter the Star-nosed Mole may burrow in the snow or run about on top of it.

This Mole shows a preference for damp meadows or marshes, but may be found in the same spots with the Eastern Mole, even in the same series of tunnels. The life-history of the Star-nosed Mole is very imperfectly known.

Subfamily *Uropsilinæ*

Genus *Neürotrichus*

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{4}$; Molars, $\frac{3}{3}$ = 36.

Shrew Mole.—*Neürotrichus gibbsii*

and related forms

Names.—Shrew Mole; Gibbs Mole.

General Description.—Smallest of the American Moles; body robust; tail about half as long as head and body, fairly thick, constricted at base, distinctly annulated, sparsely



FIG. 11. Head and forefoot of Shrew Mole

haired; snout elongated, with naked muzzle; head mole-like; forefeet lacking extreme development of the other Moles, palms longer than broad; toes not webbed; fur short, fine, with iridescent sheen.

Color.—Sexes alike in color.

Upperparts dark gray to blackish, with purple or greenish iridescence in fresh specimens; underparts similar to upperparts, sometimes lighter in tone.

Measurements.—Total length, males, 4.5 inches, females, 4.6; tail vertebræ, males, 1.5 inches, females, 1.5; hind foot, males and females, .68 inch.

Geographical Distribution.—British Columbia, Washington, Oregon and California.

Food.—Insectivorous.

Species and Subspecies of the Genus *Neurotrichus*.

Gibbs Shrew Mole.—*Neurotrichus gibbsii gibbsii* (Baird).

As just described. Found in "Extreme southwestern British Columbia, western Washington and Oregon west of the Cascade Mountains, south in the coast region to Eureka, Humboldt County, Cal., and in the interior, west of the Sierra Nevada, to South Yolla Bolly Mountain, Cal." (Jackson.)

Southern Shrew Mole; Hyacinthine Shrew Mole.—*Neurotrichus gibbsii hyacinthinus* Bangs.

Larger and usually darker colored than typical *gibbsii*. Total length, males, 4.8 inches. Found in "Coast region of California from Cuddeback, Humboldt County, south to Fremont Peak, Monterey County." (Jackson)

* * * * *

The Shrew Mole is the smallest of the American Moles and has a less-highly specialized forefoot. It is found in a rather restricted zone along the northwest coastal strip and is local in distribution. I have trapped specimens on dry hillsides near Portland, Oregon, in the same general region with *Scapanus townsendi*, the large Western Mole, but took only two over a long period. Jackson states that the Shrew Mole "prefers a damp habitat and is seldom found far from swamps, marshes, or streams." It makes a small burrow, but seems to spend some time on the surface of the ground. Its more generalized structure would indicate that this species is not such a subterranean creature as the larger Moles. But little is known of the life-history of the genus *Neurotrichus*.

SHREW

Family Soricidæ. Shrews

Size very small, including the smallest of mammals; muzzle elongate; eye small but visible; ear small and often more or less concealed in the fur; form mouse-like; skull long and narrow; anterior teeth highly specialized; zygomatic arches wanting.

Subfamily Soricinæ

Genus *Sorex*¹

Dentition: Incisors, $\frac{4}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 32.

Shrew.—*Sorex personatus*²

and related forms.

General Characters.—Size very small, except for *Microsorex* the smallest of North American mammals; muzzle sharp and pointed; eyes minute; ears nearly hidden in fur; body slender; hands and feet small and delicate; tail proportionally long, covered with hair; pelage soft and rather lax; color brownish above, lighter below; habit terrestrial; movements quick.

Color.—Sexes colored alike; some seasonal change in pelage.

Upperparts practically uniform sepia brown, with very faint sprinkling of lighter and darker hairs; hands and feet whitish; upperside of tail like back. Underparts grayish to buffy and passing gradually into darker color of upperparts; underside of tail yellowish white. Pelage everywhere slate-colored at base.

In winter pelage, slightly darker and less brown than in summer.

Immature pelage very much like that of adults.

Measurements.—Sexes of equal size. Total length, 4 inches; tail vertebrae, 1.6 inches; hind foot, .5 inch.

Geographical Distribution.—Most of North America.

Food.—Insects, adults and larval forms, and such other animal food as it can capture.

¹ For a revision of the Shrews see Merriam, *North American Fauna*, No. 10, 1895. This monograph is so old that it can scarcely be considered as authoritative today.

² According to Jackson, *Jour. Mammalogy*, Feb. 1925, p. 55, *Sorex personatus* should be changed to *Sorex cinereus*, with corresponding changes in all of the subspecies of *personatus*.

Enemies.—Snakes, Hawks, Owls, and practically all small carnivorous mammals such as Weasels, Foxes, Skunks, etcetera.

Species and Subspecies of the Genus *Sorex*.

This is a very large genus distributed throughout the Northern Hemisphere, and a large number of species and subspecies are found in North America. Many of these forms are separated from one another on cranial characters or distinctions difficult to set forth in a field book. As advised for the other large and troublesome genera, the geographic range will usually give the best clue for a preliminary determination.

Masked Shrew.—*Sorex personatus personatus* I. Geoffroy.

As just described. Found in "Boreal and Transition Zones of North America from New England to Alaska, except the southern Rocky Mountains and the Cascade-Sierra systems; south in the higher Alleghenies to Tennessee and North Carolina." (Merriam) Plate III.

Hayden Shrew.—*Sorex personatus haydeni* (Baird).

A scarcely distinguishable subspecies of *personatus* ranging in the prairie section of North and South Dakota and adjacent states and provinces. Color above, sepia brown, below, ashy gray. Total length, 3.9 inches; tail vertebræ, 1.4 inches; hind foot, .48 inch.

Labrador Shrew.—*Sorex personatus miscix* Bangs.

Larger than typical *personatus*, color paler and grayer. Upperparts (summer) near sepia brown; underparts smoke-gray; winter pelage drab gray above. Total length, 4.1 inches; tail vertebræ, 1.8 inches; hind foot, .55 inch. Found in Labrador.

Arctic Shrew.—*Sorex personatus arcticus*¹ Merriam.

Resembling typical *personatus* but slightly larger, tail longer, color paler. Summer pelage pale drab brown above, ashy below; winter pelage dusky brownish above, silvery white below. Total length, 4.2 inches; tail vertebræ, 1.6 inches; hind foot, .5 inch. Found in region about St. Michael, Norton Sound, Alaska.

Streator Shrew.—*Sorex personatus streatori* Merriam.

Larger and darker than typical *personatus*. Above, mixed sepia brown and dusky; below, ashy gray; tail sharply bi-color, dusky above, whitish below, tip dusky. Total length, 4.3 inches; tail vertebræ, 2 inches; hind foot, .5 inch. Found in southeastern Alaska.

¹ *Sorex personatus arcticus* should stand as *Sorex cinereus hollisteri*, according to Jackson.

Maryland Shrew.—*Sorex fontinalis* Hollister.

Smaller than typical *personatus* and with shorter tail, color as in *personatus*. Total length, 3.8 inches; tail vertebrae, 1.25 inches; hind foot, .40 inch. Found in "Sphagnum bogs near the District of Columbia." (Miller)

Preble Shrew.—*Sorex preblei* Jackson.

Paler and grayer than typical *personatus*. Upperparts (summer) light brown (hair-brown to olive-drab); underparts smoky gray; tail above, olive-buff, below, light brown, tip dark. Total length, 3.8 inches; tail vertebrae, 1.5 inches; hind foot, .44 inch. Found in eastern Oregon, Malheur County.

Big-tailed Shrew.—*Sorex dispar* Batchelder.

Size large; tail long. Upperparts dark slate-colored; underparts smoke-gray; tail above somewhat browner than color of back. Total length, 5.2 inches; tail vertebrae, 2.4 inches; hind foot, .6 inch. Found in "Adirondack and Catskill Mountains, New York; also in the mountains of West Virginia." (Miller)

Gaspé Shrew.—*Sorex gaspensis* Anthony and Goodwin.

Resembling *personatus* in size and proportions, but much darker; most nearly related to *dispar*. Upperparts slaty gray; feet whitish; tail above dark like back, below, whitish, tip dark; underparts smoke-gray. Total length, 4.1 inches; tail vertebrae, 1.9 inches; hind foot, .42 inch. Found on Gaspé Peninsula, Quebec.

Richardson Shrew.—*Sorex richardsoni*¹ Bachman.

Size large; tail short. Upperparts dark brown; sides fulvous to ochraceous, contrasting with upperparts; underparts washed with chestnut; tail above and at tip dusky, below, pale brownish. Total length, 4.5 inches; tail vertebrae, 1.6 inches; hind foot, .55 inch. Found in "Plains of Saskatchewan and boreal parts of Minnesota and Wisconsin; north to lower Mackenzie Valley." (Miller.)

Sorex sphagnicola = *Sorex richardsoni*, according to Preble.

Tundra Shrew.—*Sorex tundrensis* Merriam.

Size large, tail rather short. Upperparts (summer) brown; sides abruptly paler, pale buffy brown; underparts soiled whitish; tail above like back, below buffy, tip dark. Winter pelage, brown above, sides and underparts silvery whitish. Total length, 4.3 inches; tail vertebrae, 1.3 inches; hind foot .52 inch. Found in region about St. Michael, Norton Sound, Alaska.

Smoky Shrew.—*Sorex fumeus fumeus* Miller.

Size large; tail short; ears prominent. Upperparts dark slate color; underparts slaty washed with grayish; tail above, dusky, below, yellowish white. A brown phase occurs, chestnut-brown above, slightly paler below. Total length,

¹ *Sorex richardsoni* should be known as *Sorex arcticus*, according to Jackson.

4.6 inches; tail vertebræ, 1.8 inches; hind foot, .52 inch. Found in "Canadian and upper part of Transition faunas of eastern United States; southward in higher Alleghenies to mountains of North Carolina and Tennessee." (Merriam)

Northern Smoky Shrew.—*Sorex fumeus umbrosus* Jackson.

Larger than typical *fumeus* and grayer in color. Upperparts (winter) dark gray, with some hairs whitish-tipped; underparts slightly paler; tail bicolor, above fuscous, below yellowish. Summer pelage somewhat darker and browner. Total length, 5.1 inches; tail vertebræ, 2.1 inches; hind foot, .56 inch. Found in "Nova Scotia, New Brunswick, south-eastern Quebec, and Maine." (Jackson)

Wandering Shrew.—*Sorex vagrans vagrans* Baird.

Size small; tail medium. Upperparts dark brown, underparts ashy gray; tail above, dusky, below paler. Total length, 4.1 inches; tail vertebræ, 1.7 inches; hind foot, .5 inch. Found in "Southern British Columbia, western Washington and Oregon, and northern California (south on the coast to Monterey and in the mountains to old Fort Crook and Cassel). Restricted to Lower Boreal and Upper Transition Zones." (Merriam)

Dobson Shrew.—*Sorex vagrans dobsoni* (Merriam).

Slightly larger than typical *vagrans*. Upperparts sepia brown; underparts ashy to drab; tail bicolor, dark brown and drab. Total length, 4.2 inches; tail vertebræ, 1.9 inches; hind foot, .5 inch. Found in "Rocky Mountain region in northern Idaho and western Montana; also isolated mountains in Montana (Big Snowy and Pryor Mountains), Wyoming (Big Horn Mountains), and Utah (Wasatch Mountains). Restricted to Lower Boreal and Upper Transition Zones." (Merriam)

Arizona Mountain Shrew.—*Sorex vagrans monticola* (Merriam).

Resembling typical *vagrans* in size, but grayish brown in color instead of chestnut-brown. Total length, 4.4 inches; tail vertebræ, 1.9 inches; hind foot, .5 inch. Found in "Arizona (San Francisco Mountain, Springerville, Chiricahua Mountains)." (Miller)

Salt Marsh Shrew.—*Sorex halicætes* Grinnell.

Resembling typical *vagrans*, but much darker in color. Upperparts dark seal-brown, nearly black on rump; ears Vandyke brown; underparts brownish, chin and throat paler; tail unicolor, sepia. Total length, 4.2 inches; tail vertebræ, 1.6 inches; hind foot, .5 inch. Found in salt marshes of Santa Clara County, California.

Olympic Shrew.—*Sorex setosus* Elliot.

Size rather large, resembling *obscurus* in color. Upperparts brown with scattering light-tipped hairs; underparts ashy, washed with buff; tail above, dark brown, below, yellowish white. Total length, 4.8 inches; tail vertebræ, 2.2 inches;

hind foot, .52 inch. Found in Olympic Mountains, Washington.

Sierra Nevada Shrew.—*Sorex amoenus* Merriam.

Larger than *vagrans*. Upperparts sooty brown; sides paler brown; underparts buffy whitish; tail above, blackish, below, whitish, tip blackish. Total length, 4.1 inches; tail vertebræ, 1.5 inches; hind foot, .5 inch. Found in Sierra Nevada Mountains of California.

Vancouver Shrew.—*Sorex vancouverensis* Merriam.

Larger than *vagrans*, with larger forefeet. Upperparts mixed dusky and sepia brown; sides lighter than back; underparts washed with grayish; tail above, dark brown, below paler, tip dark. Total length, 4.2 inches; tail vertebræ, 1.7 inches; hind foot, .48 inch. Found on Vancouver Island, British Columbia.

Nevada Shrew.—*Sorex nevadensis* Merriam.

Resembling *vagrans* but tail shorter. Upperparts mixed slate-black and hoary; sides lighter, buffy to brownish; underparts hoary; tail bicolor, dusky and whitish, tip dark. Total length, 3.86 inches; tail vertebræ, 1.6 inches; hind foot, .5 inch. Found in "Interior of the Great Basin." (Miller)

Dusky Shrew.—*Sorex obscurus obscurus* Merriam.

Slightly larger than *vagrans*; tail longer. Upperparts sepia brown; underparts ashy; tail bicolor, above like back, below whitish. Total length, 4.4 inches; tail vertebræ, 1.8 inches; hind foot, .52 inch. Found in "British Columbia and mountains of western Washington, Idaho, Montana, Wyoming, Utah, and Colorado; south along the High Sierra Nevada in California to Mount Whitney. Restricted to Boreal Zone." (Merriam)

Wetmore Shrew.—*Sorex obscurus isolatus* Jackson.

Darker than typical *obscurus*. Upperparts (winter) dark grayish brown; underparts smoke-gray; tail faintly bicolor, olive-brown above, buffy brown below. Total length, 4.5 inches; tail vertebræ, 2 inches; hind foot, .56 inch. Found on Vancouver Island, British Columbia.

Warren Island Shrew.—*Sorex obscurus malitiosus* Jackson.

Size large, tail long. Upperparts (summer) mummy-brown, slightly darker on rump; underparts smoke-gray; tail bicolor, sepia above, buffy brown below. Winter pelage darker and grayer. Total length, 5.8 inches; tail vertebræ, 2.2 inches; hind foot, .6 inch. Found only on Warren Island, Alaska.

New Mexico Shrew.—*Sorex obscurus neomexicanus* Bailey.

Larger and slightly darker than typical *obscurus*; upperparts dull sepia brown, with less reddish than in *obscurus*; underparts with brownish suffusion. Total length, 4.6 inches; tail vertebræ, 1.6 inches; hind foot, .6 inch. Found in the Sacramento Mountains, Otero County, New Mexico.

San Bernardino Shrew.—*Sorex obscurus parvidens* Jackson.

Resembling typical *obscurus* in size and color, but differing in cranial and dental characters. Total length, 4.2 inches; tail vertebræ, 1.8 inches; hind foot, .52 inch. Found in San Bernardino Mountains, California.

Cascade Shrew.—*Sorex obscurus permiliensis* Jackson.

Resembling *setosus* but redder in summer pelage and with shorter tail. Upperparts (summer) between snuff-brown and sepia; sides slightly paler than back; underparts buffy brown to tawny olive; tail very faintly bicolor, above like back, below paler. Winter pelage: upperparts light brown. Total length, 4.7 inches; tail vertebræ, 2 inches; hind foot, .56 inch. Found about Mount Jefferson and Mount Hood, Cascade Range, Oregon.

Glacier Bay Shrew.—*Sorex glacialis* Merriam.

Size large; tail long. Upperparts dark dusky brown; underparts whitish, clearly differentiated from color of upperparts by a distinct line; tail above, dusky, below buffy, tip dark. Total length, 4.9 inches; tail vertebræ, 2.1 inches; hind foot, .54 inch. Found in region about Glacier Bay, Alaska.

Long-tailed Shrew.—*Sorex longicauda longicauda* (Merriam).

Size large; tail long; ears prominent. Upperparts dark chestnut-brown; underparts ashy washed with buffy; tail bicolor, dark brown above, buffy below. Total length, 5.2 inches; tail vertebræ, 2.4 inches; hind foot, .6 inch. Found on "Coast of southeast Alaska, from Wrangel southward; also coast of Washington, including Puget Sound and Skagit Valley." (Merriam)

Queen Charlotte Shrew.—*Sorex longicauda elassodon* Osgood.

Resembling typical *longicauda* but smaller; color as in *longicauda*. Total length, 5.3 inches; tail vertebræ, 2.2 inches; hind foot, .56 inch. Found on Moresby Island, Queen Charlotte Islands, British Columbia.

Prevost Island Shrew.—*Sorex longicauda prevostensis* Osgood.

Resembling typical *longicauda* but slightly darker and with less contrast in color of upper and lower parts. Total length, 5.4 inches; tail vertebræ, 2.3 inches; hind foot, .60 inch. Found on Prevost Island, Queen Charlotte Islands, British Columbia.

Yakutat Shrew.—*Sorex alascensis alascensis* (Merriam).

Size large; tail long but not as long as in *longicauda*. Upperparts sepia brown; underparts grayish; tail bicolor, above, dark brown, below whitish, tip dark. Total length, 4.6 inches; tail vertebræ, 2 inches; hind foot, .59 inch. Found about Yakutat Bay, Alaska.

Shumagin Islands Shrew.—*Sorex alascensis shumaginensis* Merriam.

Resembling typical *alascensis*, but slightly smaller and paler. Upperparts sepia brown mixed with light-tipped

hairs; underparts whitish. Total length, 4.5 inches; tail vertebræ, 1.7 inches; hind foot, .56 inch. Found on Popof Island, Shumagin Islands, Alaska.

Baird Shrew.—*Sorex bairdi* Merriam.

Size large, tail long. Upperparts dark chestnut-brown; underparts brownish; tail bicolor, above dark brown, below flesh color. Total length, 5.2 inches; tail vertebræ, 2.3 inches; hind foot, .6 inch. Found in western Oregon in region about the mouth of the Columbia River and east as far as the Willamette Valley.

Trowbridge Shrew.—*Sorex trowbridgii trowbridgii* Baird.

Size large, tail long, color dark. Upperparts blackish slate; underparts slaty; tail bicolor, blackish above, whitish below. Total length, 4.8 inches; tail vertebræ, 2.3 inches; hind foot, .54 inch. Found in "Western Washington and Oregon, west of Cascade Range." (Merriam)

Humboldt Shrew.—*Sorex trowbridgii humboldtensis* Jackson.

Resembling typical *trowbridgii*, but slightly larger. Upperparts (summer) dark slaty gray; underparts slightly paler; tail bicolor, blackish above, whitish below. Total length, 5.3 inches; tail vertebræ, 2.5 inches; hind foot, .56. Found in "Coast region of Humboldt and northern Mendocino Counties, California." (Jackson)

Monterey Shrew.—*Sorex montereyensis montereyensis* Merriam.

Size large; tail long; ears prominent; resembling typical *trowbridgii*. Upperparts slate-black; underparts slaty to dark brown; tail bicolor, blackish and whitish. Total length, 4.8 inches, tail vertebræ, 2.1 inches; hind foot, .56 inch. Found in "Coast strip and Sierra Nevada of California; south on the coast at least to Morro and San Luis Obispo; south in the Sierra to Sequoia National Park and East Fork Kaweah River." (Merriam)

Yosemite Shrew.—*Sorex montereyensis mariposæ* Grinnell.

Closely resembling typical *montereyensis* but paler and grayer. Summer pelage, upperparts, hair-brown mixed with drab gray; tail bicolor, above, drab, below, dull white; underparts drab gray. Total length, 4.6 inches; tail vertebræ, 2 inches; hind foot, .56 inch. Found in the Yosemite Valley, in the Transition Zone of the Central Sierra Nevada, California.

Adorned Shrew.—*Sorex ornatus* Merriam.

Upperparts ashy gray, abruptly darker on rump; underparts whitish; tail faintly bicolor, dark above, paler below, terminal half dark above and below. Total length, 4.3 inches; tail vertebræ, 1.7 inches; hind foot, .5 inch. Found in "Mountains of southern California, from head of Ventura River and Mount Piños easterly to San Bernardino Peak, and south through the San Jacinto range to Santa Ysabel." (Merriam)

California Shrew.—*Sorex californicus californicus* Merriam.

Size small. Upperparts grizzled dark ashy gray; underparts slaty, washed with whitish. Total length, 3.7 inches; tail vertebræ, 1.4 inches; hind foot, .46 inch. Found in "Sonoma, Contra Costa, and Alameda Counties, central California." (Miller)

Ashland Shrew.—*Sorex trigonirostris* Jackson.

Resembling *californicus* but differing in cranial characters. Upperparts (summer) light grayish brown; sides lighter than back; underparts pale smoke-gray; tail olive-brown above, buffy below. Total length, 3.8 inches; tail vertebræ, 1.4 inches; hind foot, .48 inch. Found in region about Ashland, Jackson County, Oregon.

Suisun Shrew.—*Sorex sinuosus* Grinnell.

Closely related to *californicus* but much darker in color. Upperparts blackish along back, with metallic sheen; sides and underparts deep clove-brown; tail unicolor, dark seal-brown. Total length, 4.1 inches; tail vertebræ, 1.55 inches; hind foot, .5 inch. Found in "the brackish marshes of Grizzly Island, bordering Suisun Bay," Solano County, California. (Grinnell)

Shasta Shrew.—*Sorex shastensis* Merriam.

Smaller than typical *vagrans*. Upperparts dull yellowish brown in summer; dark slaty gray in winter; underparts ashy brown; tail bicolor, above dusky, below buffy, tip dark. Total length, 3.6 inches; tail vertebræ, 1.4 inches; hind foot, .48 inch. Found in the Canadian Zone on Mount Shasta, California.

Inyo Shrew.—*Sorex tenellus tenellus* Merriam.

Size small; colors pale. Upperparts pale ash-gray; underparts white; tail bicolor, above dark, below white. Total length, 4.0 inches; tail vertebræ, 1.6 inches; hind foot, .5 inch. Found in southeastern California.

Mount Lyell Shrew.—*Sorex tenellus lyelli* Merriam.

Resembling typical *tenellus* but slightly browner above. Total length, 4.1 inches; tail vertebræ, 1.6 inches; hind foot, .48 inch. Found on Mount Lyell, Tuolumne County, California.

White Mountain Shrew.—*Sorex tenellus myops* Merriam.

Resembling typical *tenellus*, but slightly smaller, ears larger, color paler. Total length, 3.9 inches; tail vertebræ, 1.64 inches; hind foot, .5 inch. Found in the White Mountains, Inyo County, California.

Dwarf Shrew.—*Sorex tenellus nanus* Merriam.

Size very small, one of the smallest of North American Shrews. Upperparts sepia brown; sides paler than back; underparts ashy; tail bicolor, above like back, below whitish, tip dark. Total length, 4.2 inches; tail vertebræ, 1.7 inches; hind foot, .40 inch. Found in Estes Park, Larimer County, Colorado.

Carolina Shrew.—*Sorex longirostris* Bachman.

Size small; ears conspicuous; resembling *personatus*. Upperparts chestnut-brown; underparts ashy to drab; tail above dark, below paler. Total length, 3.6 inches; tail vertebræ, 1.3 inches; hind foot, .43 inch. Found in "Austroriparian fauna of North Carolina, South Carolina, and Georgia; west to southern Illinois; north to the District of Columbia." (Miller)

Fisher Shrew.—*Sorex fisheri* Merriam.

Resembling *longirostris* but larger, coloration duller, ears larger. Upperparts dull chestnut-brown; underparts drab brown; tail dark above, pale brown below, tip dark; nose and ears dark. Total length, 4.2 inches; tail vertebræ, 1.55 inches; hind foot, .48 inch. Found in Dismal Swamp, Norfolk County, Virginia.

Pacific Shrew.—*Sorex pacificus pacificus* Coues.

Largest Shrew of the genus *Sorex*; ears prominent. Upperparts cinnamon-rufous, in winter mixed with dark-tipped hairs; underparts like upper. Total length, 6 inches; tail vertebræ, 2.5 inches; hind foot, .68 inch. Found in "A narrow belt along the Pacific Coast from Point Reyes, California, to Yaquina Bay, Oregon." (Merriam)

Sonoma Shrew.—*Sorex pacificus sonomæ* Jackson.

Smaller and somewhat darker than typical *pacificus*. Upperparts (summer) mummy-brown; underparts olive-brown to buffy brown. Total length, 5.3 inches; tail vertebræ 2.4 inches; hind foot, .64 inch. Found in "Coast region of California from Point Arena, Mendocino County, south to Point Reyes, Marin County." (Jackson)

Yaquina Shrew.—*Sorex yaquinae* Jackson.

Resembling *pacificus* but smaller and tail shorter. Upperparts fuscous (winter); underparts slightly paler than back; tail faintly bicolor, drab above, light drab below. Summer pelage redder, upperparts near cinnamon-brown. Total length, 5.5 inches; tail vertebræ, 2.4 inches; hind foot, .64 inch. Found in western Oregon in region west of the Cascades and north of the Umpqua River.

Pribilof Shrew.—*Sorex pribilofensis* Merriam.

Size small; tail short, thick, hairy; ears prominent. Upperparts chocolate-brown; sides ochraceous buff; underparts soiled whitish; tail bicolor, brown above, white below. Total length, 4.2 inches; tail vertebræ, 1.4 inches; hind foot, .54 inch. Found on St. Paul Island, Pribilof Islands, Alaska.

Merriam Shrew.—*Sorex merriami* Dobson.

Size small; ears prominent; cranial characters very peculiar. Upperparts ashy gray; underparts white; tail above, buffy; below, white. Total length, 3.8 inches; tail vertebræ, 1.4 inches; hind foot, .44 inch. Very rare and has been found on Little Bighorn River near Fort Custer, Montana; near Antelope, Oregon; near Medora, North Dakota; in Elko County, Nevada; and in Columbia County, Washington.

White-chinned Shrew.—*Sorex leucogenys* Osgood.

Resembling *merriami* but larger. Upperparts pale brownish drab; sides slightly paler; underparts creamy white; chin and sides of face below eye to end of nose pure creamy white to roots of hair; tail light brownish above, white below, tip white. Total length, 4.3 inches; tail vertebræ, 1.5 inches; hind foot, .5 inch. Found in the canyon of Beaver River, Beaver County, Utah.

* * * * * *

Shrews are widely distributed and often are quite abundant in a region, but for all of that are rather infrequently observed. Their small size, quick movements, and habit of working under cover do not give one much opportunity to see these least of all mammals. Although these tiny creatures seem to be most active at night, they are often abroad in full daylight. A trap line usually takes a few Shrews between sunrise and sunset, but many more will be caught after dark. When one does see a Shrew it is usually but a glimpse as the animal rustles among fallen leaves or darts from under one log to another. Shrews of the genus *Sorex* may be instantly recognized by their small size, very sharp muzzle, tiny eyes, and slender form.

They are such highly organized, nervous creatures that they give instant response to any stimulation. Live Shrews which I have trapped have started violently when I have attempted to give an imitation, rather crudely I fear, of their fine, high-pitched squeak, and I have actually had one die in my hand from nervous shock. This does not necessarily indicate that the Shrew is a timid animal and the records go to show quite the contrary.

These tiny mammals are highly predatory, courageous hunters and do not hesitate to attack animals several times their own weight. Although living largely on insect food, which can not put up much resistance, Shrews undoubtedly kill and eat Mice whenever the rodents are encountered under circumstances which allow the Shrew to close in a rough-and-tumble fight. Mice put into cages with Shrews are dispatched with a celerity that indicates this is by no means a new experience for the Shrew at least; and as a further index to the Shrew character there are accounts to tell us that a cage can not contain more than one Shrew at a time for one will kill and eat the other if two are confined.

Shrews require an abundance of food and consume a sur-

prising amount because of a very rapid rate of digestion. Deprived of food for even a few hours they starve to death.

In general, *Sorex* may be said to favor localities where moisture and soil conditions support an abundance of vegetation. Fallen logs, rock piles, rank growths of grass, or the banks of small streams where shrubbery is thick, all offer suitable home sites. Although these Shrews do not seem to make burrows of their own, they frequently use those made by Mice or Moles, and the surface runways of Meadow Mice serve the Shrews as convenient hunting grounds.

Shrews are active throughout the year and do not hibernate. Cold has no terrors for them and they range north of the Arctic Circle.

Very little is known about the home life of Shrews. The number of young is probably four or five. The young must stay in the home nest until they reach nearly adult size, for one never sees immature Shrews much smaller than their parents.

Genus *Neosorex*¹

Dentition: Incisors, $\frac{4}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 32

Water Shrew—*Neosorex palustris*

and related forms.

Names.—Water Shrew; Marsh Shrew; Black and White Shrew. Plate III.

General Description.—A large, long-tailed Shrew specialized for an aquatic life; feet large and broad, hind feet especially so, fringed with a row of short, stiff hairs; third and fourth toes united at base and somewhat webbed.

Color.—Sexes colored alike; seasonal variation not especially marked.

Upperparts dusky, some of the hairs white-tipped to produce a frosted appearance; tail sharply bicolor, blackish above, white below, tip dark; feet dark on outer side, whitish on inner; underparts white, sometimes darkened on breast and inguinal region, sharply differentiated from color of upperparts.

Immature very much like adults.

¹ See footnote, page 25; also Jackson: *Journ. Mamm.*, Feb., 1926, p. 57.

Measurements.—Sexes of equal size. Total length, 6.4 inches; tail vertebrae, 2.7 inches; hind foot, .8 inch.

Geographical Distribution.—Colder portions of North America.

Food.—Insects and other forms of aquatic life.

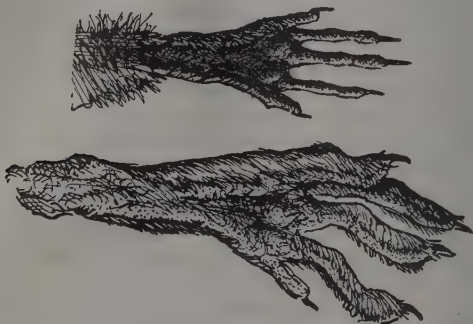


FIG. 12. Hind foot of Common Shrew (*Sorex*), above, compared with the hind foot of Water Shrew (*Neosorex*) which is fringed with stiff hairs

Enemies.—Probably preyed on by Water Snakes and such small carnivores as the Mink, but I have no personal observations on this point nor have I seen any actual records.

Species and Subspecies of the Genus **Neosorex**.¹

Subgenus **Neosorex**

Characterized by light-colored underparts in sharp contrast to dark-colored upperparts.

Richardson Water Shrew.—*Neosorex palustris palustris* (Richardson).

As described above. Found in "Parts of the Boreal Zone from Minnesota to the east base of the Rocky Mountains." (Merriam)

Nova Scotia Water Shrew.—*Neosorex palustris gloveralleni* (Jackson).¹

Resembling typical *palustris* in size, but color of upperparts slightly browner. Upperparts very dark blackish brown; sides slightly paler; underparts soiled whitish, lightly

¹ *Neosorex palustris acadicus*, of Miller, *North American Recent Mammals*.

washed with pale brown on the chest; tail bicolor, upperside like back, lower side white, tip dark. Total length, 6.4 inches; tail vertebræ, 2.6 inches; hind foot, .8 inch. Found in Nova Scotia.

White-chinned Water Shrew.—*Neosorex palustris albibarbis* (Cope).

Resembling typical *palustris* in pattern of coloration and in size, but underparts washed with dusky. Upperparts blackish slate, with light-tipped hairs; chin whitish; underparts suffused with dusky. Total length, 6.2 inches; tail vertebræ, 2.7 inches; hind foot, .76 inch. Found in "Boreal parts of eastern North America from mountains of Pennsylvania and New York northward to Labrador." (Merriam)

Great Lakes Water Shrew.—*Neosorex palustris hydrobadistes* (Jackson).

Resembling typical *palustris* in general color, but slightly smaller. Coloration more or less intermediate between *palustris palustris* and *palustris albibarbis*. Total length, 6 inches; tail vertebræ, 2.5 inches; hind foot, .8 inch. Found in "Minnesota, Wisconsin, and northern Michigan." (Jackson)

Rocky Mountain Water Shrew.—*Neosorex palustris navigator* (Baird).

Smaller than typical *palustris*, coloration lighter. Upperparts slaty, mixed with hoary; underparts and tail as in typical *palustris*. Found in "The Rocky Mountains and outlying ranges from British Columbia to southern Colorado and the Sierra Nevada of California south to the Sequoia National Park." (Merriam)

Alaska Water Shrew.—*Neosorex alaskanus* (Merriam).

Smaller than *navigator*. Upperparts slaty, frosted with light-tipped hairs; underparts and feet whitish; tail above, dusky, below, whitish, tip dark. Total length, 6 inches; tail vertebræ, 2.8 inches; hind foot, .74 inch. Found in region about Glacier Bay, Alaska.

Unalaska Water Shrew.—*Neosorex hydrodromus* (Dobson).

Size very small for a Water Shrew. "Fur reddish brown above, yellowish brown beneath; chin, throat, and chest with grayish-tipped hairs; the base of the hairs both above and beneath dark bluish gray." (Dobson) Total length, 4 inches; tail vertebræ, 1.8 inches; hind foot, .52 inch. Only one specimen has ever been taken, as far as I can tell from records, and this came from Unalaska Island, Alaska.

Subgenus *Atophyrax*

Characterized by coloration of underparts differing only slightly from that of upperparts; no marked contrasts in color (except in case of *albiventer*).

Bendire Water Shrew.—*Neosorex bendirii bendirii* (Merriam).

Resembling *palustris* in general size, but color pattern

nearly unicolor. Upperparts dull sooty slate color; tail dusky above and below; underparts only slightly paler than upperparts. Total length, 6 inches; tail vertebræ, 2.8 inches; hind foot, .8 inch. Found in "Klamath Basin, Oregon and thence northward along east side of Cascade range to Puget Sound (Port Moody, British Columbia); westward (probably through Klamath River Valley) to coast of California, and southward to Sonoma County." (Merriam)

Palmer Water Shrew.—*Neosorex bendirii palmeri* (Merriam). Larger and blacker than typical *bendirii*. Upperparts glossy black; underparts sooty slate color; tail dusky above and below. Total length, 6.6 inches; tail vertebræ, 2.9 inches; hind foot, .8 inch. Found along "Coast of Oregon and Willamette Valley; limits of range unknown." (Merriam)

Olympic Water Shrew.—*Neosorex bendirii albiventer* (Merriam).

Larger than typical *bendirii*, with longer tail and white underparts. Upperparts sooty slate color; underparts white, with dusky wash on pectoral region and on belly; tail above, blackish, below, slightly paler, no marked color line between upper and lower sides. Total length, 6.6 inches; tail vertebræ, 3.1 inches; hind foot, .84 inch. Found in Olympic Mountains of Washington.

* * * * *

The Water Shrews are the largest members of the Shrew family found in North America and are beautiful little creatures. The family characters are readily recognized in the long, sharp nose, tiny eyes, simple forefeet, and fine, close fur. From the other Shrews they may be distinguished by large size, long tail, slaty black upperparts, and broad, fringed, hind feet. In size of body they may be equalled or exceeded by the species of *Blarina*, the Short-tailed Shrews, but the total length of the Water Shrews is noticeably greater.

These Shrews frequent small streams or the shores of marshes and are truly aquatic in habit. They are never encountered in dry or arid sections and seemingly do not go very far from water. Probably a large part, if not most, of their food is caught in the water, and the structure of these animals indicates that they are well adapted for this type of existence. The close pelage keeps the Water Shrew from wetting through to the skin, and the large, partly webbed, hind feet serve as capable propelling organs.

There is much to be learned of the life-history of the mem-

bers of the genus *Neosorex*. They are very seldom seen and because of their habits are not easily observed. Available records indicate that the young number about six.

Genus *Microsorex*¹

Dentition: Incisors, $\frac{4}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 32.

Pigmy Shrew.—*Microsorex hoyi*

and related forms

Names.—Pigmy Shrew; Least Shrew.

General Description.—A very small Shrew, with short tail; except for size, resembling small members of the genus *Sorex* in superficial appearance, but differing in cranial and dental characters.

Color.—Sexes colored alike, seasonal variation not very marked.

Upperparts.—Sepia brown; tail bicolor, above dark brown, below whitish.

Underparts.—Ashy with wash of buffy on throat, breast, and sometimes on belly.

Immature pelage very much like adult.

Measurements.—Sexes of equal size. Total length 3.3 inches; tail vertebræ, 1.3 inches; hind foot, .42 inch.

Geographical Distribution.—Eastern North America.

Food.—Insects.

Enemies.—Snakes, Owls, Hawks, and small carnivorous mammals.

Species and Subspecies of the Genus *Microsorex*

Hoy Pigmy Shrew.—*Microsorex hoyi hoyi* (Baird).

As described above. Found in the northern United States and adjoining Canadian provinces from Nova Scotia, Quebec, and New York west to Manitoba and North Dakota.

Thompson Pigmy Shrew.—*Microsorex hoyi thompsoni* (Baird).

Upperparts "dark olive-brown, slightly hoary; paler on sides. Beneath, ashy white. No tinge of chestnut or

¹ Although this genus is treated by Merriam in his synopsis of the Shrews, *North American Fauna*, No. 10, 1895, so little material was available that only one form was recognized. Jackson, 1925, lists seven forms, but as yet no satisfactory account of distribution has been published.

reddish brown." (Baird) Total length, 3.25 inches; tail vertebræ, 1.25 inches; hind foot, .36 inch. Found in vicinity of Burlington, Vermont; also from northern New York.

Virginia Pigmy Shrew.—*Microsorex hoyi winnemana* (Preble). Smaller than typical *hoyi*. Upperparts (summer) grayish brown, slightly tinged with ochraceous about head and face; tail bicolor, above like back, below, silvery gray; underparts ashy gray. Total length, 3.12 inches; tail vertebræ, 1.12 inches; hind foot, .36 inch. Found in the vicinity of the Potomac River, Fairfax County, Virginia.

Intermediate Pigmy Shrew.—*Microsorex hoyi intervectus* Jackson.

Resembling typical *hoyi* but slightly grayer in summer pelage. Total length, 3.7 inches; tail vertebræ, 1.24 inches; hind foot, .40 inch. Found "From Quebec to northern Michigan and northern Wisconsin, thence northwest to northern Alberta, northwest Territories, and northern British Columbia." (Jackson)

Keewatin Pigmy Shrew.—*Microsorex hoyi alnorum* (Preble). Larger than typical *hoyi*. Upperparts sepia brown; underparts ashy, without any suffusion of buffy. Total length, 3.9 inches; tail vertebræ, 1.4 inches; hind foot, .48 inch. Found in vicinity of Robinson Portage, Keewatin, Canada.

Cook Inlet Pigmy Shrew.—*Microsorex hoyi eximius* (Osgood). Larger and paler than *hoyi*. Upperparts uniform grayish sepia; underparts pale drab; tail bicolor. Total length, 3.9 inches; tail vertebræ, 1.24 inches; hind foot, .44 inch. Found in vicinity of Cook Inlet, Alaska.

Washington Pigmy Shrew.—*Microsorex hoyi washingtoni* Jackson.

"Color more reddish brown (less grayish) than in any other member of the genus." (Jackson) Total length, 3.6 inches; tail vertebræ, 1.1 inches; hind foot, .36 inch. Found in vicinity of Loon Lake, Stevens County, Washington.

* * * * *

In many respects the Pigmy Shrews resemble the small species of *Sorex*, the common Shrews, except in the matter of size. Pigmy Shrews seem to be rare and have never been found in even moderate abundance. As an example of the difficulty in securing specimens of this genus, it may be pointed out that only as recently as 1910 a new Pigmy Shrew, *Microsorex hoyi winnemana*, was described from Virginia. In spite of the many years of work and study upon the mammals of the Atlantic seaboard, this tiniest of mammals had escaped discovery.

It is to be expected that the life-history of this genus is very much the same as for *Sorex*, although very little has been

written about its habits. Of recent years enough specimens have been secured to indicate that the genus has a much wider range than was formerly suspected.

These Shrews are said to prefer dry clearings and not dark woods, nor damp, marshy localities.

Genus *Cryptotis*¹

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 30.

Little Shrew.—*Cryptotis parva*

and related forms

Names.—Little Shrew; Little Short-tailed Shrew.

General Description.—Bearing a close superficial resemblance to the Short-tailed Shrew, but differing in cranial and dental characters; smaller in size, smallest of American mammals.

Color.—Sexes colored alike, a seasonal variation.

Upperparts.—Sepia or dark brown, darker in winter than summer; tail bicolor, above like back, below like belly.

Underparts.—Ashy gray.

Measurements.—Sexes of equal size. Total length, 3.1 inches; tail vertebræ, .64 inch; hind foot, .42 inch.

Geographical Distribution.—Eastern United States.

Food.—Insects and such animal food as it is able to capture.

Enemies.—Snakes, Hawks, Owls, Weasels, and other small carnivores.

Species and Subspecies of the Genus *Cryptotis*

Little Short-tailed Shrew.—*Cryptotis parva* (Say).

As described above. Found in "Austral region of the eastern United States (including both the Austroriparian and Carolinian faunas) from Texas and eastern Nebraska eastward to the Atlantic coast from Staten Island southward." (Miller)

Florida Short-tailed Shrew.—*Cryptotis floridana* (Merriam).

Larger than *parva*. Upperparts (winter) iron-gray, with light-tipped hairs, browner in summer; underparts paler. Total length, 3.6 inches; tail vertebræ, .88 inch; hind foot, .48 inch. Found in "Peninsular Florida, south of latitude 29°. Exact limits of range unknown." (Merriam)

¹ See Foot-note, p. 25.

Rio Grande Short-tailed Shrew.—*Cryptotis berlandieri* (Baird). Size slightly greater than *parva*, pelage shorter. Upperparts, in winter, chestnut, in summer, ash-brown; underparts grayish. Total length, 3.3 inches; tail vertebræ, .76 inch; hind foot, .48 inch. Found in "Lower Rio Grande Valley, on both sides of the river, and probably the coast region of southern Texas also. Limits of range unknown." (Merriam)

* * * * *

The species of the genus *Cryptotis* are not as abundant north of the Rio Grande as they are southward. The group reaches its greatest development in Mexico and Central America, and a few species have even penetrated into South America. The Little Shrew is easily identified by the combination of small size and short tail. In general habits it is much like other Shrews, showing a fondness for dark, damp localities where there is an abundance of cover and plenty of insect food.

Genus *Blarina*¹

Dentition: Incisors, $\frac{4}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 32.

Short-tailed Shrew.—*Blarina brevicauda*

and related forms

Names.—Short-tailed Shrew; Short-tailed Blarina; Mole Shrew. Plate III.

General Description.—A short-tailed Shrew with rather robust form. External ears very much reduced; tail less than half the length of head and body; legs short; pelage soft and velvety.

Color.—Sexes colored alike; some seasonal variation.

Upperparts.—Dark slate-colored in winter, paler in summer, glossy in new pelage; tail blackish above, paler below.

Underparts.—Ashy gray.

Immature much like adult pelage.

Measurements.—Sexes of equal size. Total length, 5 inches; tail vertebræ, 1 inch; hind foot, .66 inch.

Geographical Distribution.—Eastern half of North America.

¹ For a revision of this genus see Merriam, *North American Fauna*, No. 10, 1895. This monograph is too old to include many of the forms known today.



FIG. 13. Short-tailed Shrew

Food.—Insects, Mice, and such animal food as it can capture; snails.

Enemies.—Snakes, Hawks, Owls, Weasels, Skunks, Foxes, and other small carnivores.

Species and Subspecies of the Genus *Blarina*

Large Short-tailed Shrew.—*Blarina brevicauda brevicauda* (Say)

As described above. Found in Nebraska and Manitoba eastward in Upper Austral and Transition Zones.

Blarina brevicauda talpoides (Gapper) of Ontario, Canada, is apparently indistinguishable from typical *brevicauda*.

Martha's Vineyard Short-tailed Shrew.—*Blarina brevicauda aloga* Bangs.

Slightly smaller than typical *brevicauda*. Upperparts dark brownish drab; underparts silvery gray; feet white; tail bicolor, dusky above, grayish below. Total length, 4.8 inches; tail vertebræ, 1 inch; hind foot, .58 inch. Found on Island of Martha's Vineyard, Massachusetts.

Nantucket Short-tailed Shrew.—*Blarina brevicauda compacta* Bangs.

Resembling *aloga* but different in color. Upperparts slate-gray; underparts very similar to upperparts and no line of demarcation; feet grayish; tail unicolor, dusky. Total length, 4.8 inches; tail vertebræ, .9 inch; hind foot, .58 inch. Found on Nantucket Island, Massachusetts.

Carolina Short-tailed Shrew.—*Blarina brevicauda carolinensis* (Bachman).

Much smaller than typical *brevicauda*. Upperparts dark slaty, in summer tinged with brownish; underparts slightly paler. Total length, 4 inches; tail vertebræ, .8 inch; hind foot, .5 inch. Found in "Austro-riparian fauna from the mouth of Chesapeake Bay to Arkansas." (Merriam)

Everglade Short-tailed Shrew.—*Blarina brevicauda peninsulæ* (Merriam).

Resembling *carolinensis* but hind foot larger and color more slaty. Upperparts uniform slate-black, duller below.

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Total length, 3.9 inches; tail vertebræ, .8 inch; hind foot, .55 inch. Found on "Peninsula of Florida, south of latitude 28°." (Merriam)

Sylvan Short-tailed Shrew.—*Blarina brevicauda hulophaga* Elliot.

Resembling *carolinensis* but lighter colored; tail very short. Upperparts uniform silvery gray to light brownish; underparts slightly paler; tail above brown, below brownish white. Total length, 3.7 inches; tail vertebræ, .7 inch; hind foot, .5 inch. Found in Murray County, Oklahoma.

Dismal Swamp Short-tailed Shrew.—*Blarina telmalestes* Merriam.

Resembling typical *brevicauda* but hind feet longer and color different. Upperparts uniform dark slate-gray, slightly darker on nose and rump; feet and tail blackish; underparts like upperparts. Total length, 4.8 inches; tail vertebræ, 1.1 inches; hind foot, .64 inch. Found in Dismal Swamp, Virginia.

* * * * *

The Short-tailed Shrews, subspecies of *Blarina brevicauda*, may be told by their robust (for a Shrew) bodies, rather large size (comparatively) and short tails. In addition, the pelage is very soft and mole-like.

These Shrews are widely distributed in the eastern states and southern Canada, and display that trait which is quite characteristic of the family in North America, a preference for dark, damp localities. Mossy banks, old logs, leaf-covered forest floors all afford shelter and harbor food for these little hunters. Although they do not climb above the ground, they go everywhere else and scout on the surface and under the surface. They follow the runways and use the burrows of other mammals and on occasion dig their own subterranean paths. They are active throughout the year and although seldom seen are about during daylight hours.

It is a rather peculiar fact that while these Shrews are a successful group in eastern North America, they have never become established like their relatives, the Long-tailed Shrews (*Sorex*), in western North America.

The Short-tailed Shrew usually has five young in a litter and the nest is in an underground den or under rocks or stumps. The female makes a warm nest and lines it with shredded material such as grass and leaves. The young may be born from April to fall or even later.

CRAWFORD SHREW

Genus *Notiosorex*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 28

Crawford Shrew.—*Notiosorex crawfordi crawfordi*

Names.—Crawford Shrew; Gray Shrew.

General Description.—A small Shrew with conspicuous external ear, relatively short tail, and slender body.

Color.—Sexes colored alike.

Upperparts.—Olive-gray; tail above like back, below like underparts.

Underparts.—Whitish.

Measurements.—Sexes of equal size. Total length, 3.6 inches; tail vertebræ, 1.24 inches; hind foot, .44 inch.

Geographical Distribution.—"Parts of Lower Sonoran Zone from eastern Texas to southern California, and thence southward to the cape region of the peninsula of Lower California." (Merriam)

Food.—Same as that of *Sorex*.

Enemies.—As for *Sorex*.

Species and Subspecies of the Genus *Notiosorex*

Only the one form is known from the United States. *Notiosorex crawfordi crawfordi* (Coues).

* * * * *

The Gray Shrew is the rarest of the North American Shrews. Unlike the other members of the family, it lives in dry regions and not only does it appear to be rather local in its distribution, but also exceedingly scarce in the regions where it is known to occur. The capture of one of these mammals is a noteworthy achievement, and any collector who secures data on the life-history of this little-known creature should earn a niche in the mammal Hall of Fame.



Order CHIROPTERA.¹ BATS

Suborder MICROCHIROPTERA (Bats exclusive of the Old World Fruit-eating Bats, the Megachiroptera)

Mammals with highly specialized structures for true flight, which include modified forelimbs; greatly elongated fingers which are joined together and to the sides of body and legs by a continuous membrane; shoulder girdle more specialized than pelvis, the sternum generally with a keel; knee directed backward to allow for rotation of leg. Tragus (a specialized



FIG. 14. Big Brown Bat

membranous process within the ear-conch) present in all American forms; dentition normally of insectivorous type; molar teeth of upper jaw quite different from those of lower.

¹ For a very full and exhaustive treatment of all the known families and genera of Bats see G. S. Miller, Jr., *The Families and Genera of Bats*, Bull. 57, U. S. Nat. Mus., 1907.

This is a very large suborder containing a great many forms which in their ranges cover most of the Eastern and Western Hemispheres. Practically all of the forms are crepuscular or nocturnal in habit. While the greater number of Bats in this suborder are strictly insectivorous, there are some which are frugivorous, and a very small family the members of which are sanguivorous and highly specialized for a blood diet. Only the insectivorous forms range as far north as the United States.

From many observations, it would appear that all of our Bats which have a summer range in a region of cold winters either hibernate or migrate to a warmer region during the period when insect life is scarce. The fact that these Bats take on a layer of fat at the close of summer also points to an approaching drain upon the constitution, such as a dormant season or an extended flight.

Under the heading of enemies of Bats, the Owl is listed for each species. For only a few of the species are there definite, authentic records of Bat skulls taken from Owl pellets, notably *Eptesicus* and *Lasionycteris*, but after a rather extensive examination of Owl pellets collected in tropical America, in which I have found the remains of many Bats, covering the range from fruit-eating species to the most active insectivorous forms, I have reached the conclusion that Owls are quite capable of preying on Bats and are real, potential enemies.

Family **Phyllostomidæ**. American Leaf-nosed Bats

"Tragus present, variously thickened and notched; a simple nose-leaf generally present, though occasionally rudimentary or absent.

"The members of the family Phyllostomidæ are recognizable by the presence of three completely bony phalanges in the third finger, the entire premaxillary, the slender, incomplete fibula, and the well-developed molar teeth. Though some of the genera lack cutaneous nasal outgrowths, those which have nose-leaves are the only American leaf-nosed bats, and these structures are never as highly developed as in some of the Old World families." (Miller)

Subfamily **Phyllostominæ**Genus **Macrotus**

Dentition: Incisors, $\frac{2}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{3}$; Molars, $\frac{3}{3}$ = 34.

**California Leaf-nosed Bat.—*Macrotus californicus*
Baird**

General Description.—A medium-sized Bat with tall, upright leaf on nose; very large, papery ears which are connected at their bases by a band which crosses the forehead; tragus long, slender, pointed; interfemoral membrane not very extensive.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts.—Pelage light-colored, almost white, at base; hairs tipped with brown; membranes brownish.

Underparts.—Like upperparts but slightly paler.

Measurements.—Total length, 3.8 inches; tail vertebræ, 1.6 inches; hind foot, .45 inch; ear from crown, 1.1 inches; wing expanse, 13 inches.

Geographical Distribution.—Arid sections of the southwestern United States south into Lower California and Mexico.

Food.—Insects.

Enemies.—Owls.

* * * * *

Only one species of the genus *Macrotus* reaches the United States, although other species have a wide distribution in tropical America. Writing of the California Leaf-nosed Bat, Stephens (*California Mammals*, p. 276) says: "In California they frequent valleys and foothills. They are probably migratory. I know of no instance of their occurrence in California in winter, and I have failed to find them at all in January in a place where I can nearly always find them in spring and summer. They probably spend the day in caves, crevices in rocks and similar dark places. I have not seen them on the wing until all the twilight has faded away. The young are born in June. More than half of the females bear two young, the remainder but one."

Family Vespertilionidæ¹

This family includes most of the species of Bats found in North America, north of the Rio Grande. The members of the Vespertilionidæ are among the most highly specialized of the entire order and have progressed farther from terrestrial mammals than most of the other families of Bats, with respect to the greatly developed flight mechanism. Only two other families, the Molossidæ and the Mystacopidæ, display an equal degree of flight perfection, and even these two families lack the extreme subordination of the ulna seen in the Vespertilionidæ.

Species of the Vespertilionidæ are characterized by absence of leaf-like outgrowths on muzzle and lips; separate ears (in most genera), with well-developed tragi which are straight or slightly curved; only two bony phalanges in third finger; absence of sucking disks on sole and thumb; wide interfemoral membrane; long tail which reaches to edge of interfemoral membrane but never extends much beyond it or becomes free.

The most diagnostic internal characters are a highly developed double articulation between scapula and humerus; greatly reduced ulna; shoulder girdle and pelvis unmodified in fundamental details; teeth normal (insectivorous); a conspicuous emargination at the anterior end of the bony palate.

The vespertilionids are mainly small to medium-sized Bats and none of them (in North America) attain the size of some of the Phyllostomidæ of tropical America. The Vespertilionidæ are very widely distributed geographically, cosmopolitan in fact, and are found in greatest number of species in the Northern Hemisphere.

While some of the North American species of the Vespertilionidæ are social in habit and may be found associated in good-sized colonies, many of the species are found only in small numbers, and in temperate regions the Bat population seldom appears to be very large. Some of the forms are definitely known to be migratory, others are suspected to be so, while still others are found hibernating where winters are severe.

All of the North American members of the Vespertilionidæ are strictly insectivorous in diet.

¹ See G. S. Miller, Jr., *North American Fauna*, No. 13, 1897, for a revision of the Vespertilionidæ of North America. Many species have been described, however, since this paper was published.

Subfamily **Vespertilioninæ**

Genus **Myotis**

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 38.

Little Brown Bat.—Myotis lucifugus

and related forms

General Description.—A small, delicately-built Bat with hairy face, narrow ear, slender tragus, rather ample membranes, and long tail; pelage fairly long and soft; upper side of interfemoral membrane sparsely haired on basal fourth.

Color.—Adults colored alike; no very noticeable seasonal variation.

Upperparts dull brown, the fur slate-colored at base; membranes brownish.

Underparts a little paler and more yellowish than upperparts.

Measurements.—Total length, 3.6 inches; tail vertebræ, 1.6 inches; hind foot, .35 inch; length of forearm, 1.5 inches.

Geographical Distribution.—Most of North America.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus **Myotis**

This is a difficult group and a brief written synopsis can not take the layman far. Details of the skull, of the ear structure, and the finer shades of color distinction can best be shown by the actual comparison of specimens, and there is not space in this field book to set these differences forth at length. The genus has been revised by G. S. Miller, Jr., and G. M. Allen, and the forthcoming publication of their studies will supply a needed guide to the student.

Little Brown Bat.—Myotis lucifugus lucifugus (Le Conte).

As described above; ear about reaching nostril when laid forward. Found in "The whole of North America north of the southern boundary of the United States, except in the Rocky Mountains and on the Pacific coast of California, Oregon, Washington, British Columbia, and southern Alaska." (Miller). Plate III.

Alaskan Little Brown Bat.—*Myotis lucifugus alascensis* Miller.

Like typical *lucifugus* but darker and with longer ears. Total length, 3.6 inches; tail vertebræ, 1.5 inches; hind foot, .6 inch. Found in "Humid coast district of southern Alaska and northern British Columbia." (Miller)

High Sierra Bat.—*Myotis lucifugus altipetens* (H. W. Grinnell). Somewhat similar to *alascensis* but yellower, upperparts yellowish gray. Total length, 3.4 inches; tail vertebræ, 1.4 inches; hind foot, .4 inch; forearm, 1.4 inches. Found in "the central Sierra Nevada, the vicinity of Mount Shasta, and the Warner Mountains." (Grinnell).

White-edged Bat.—*Myotis albicinctus* G. M. Allen.

"A bat of the size and proportions of *M. lucifugus* but very pallid, with conspicuous white border to the wing membranes, broadest between the fifth finger and tarsus." (Allen) Upperparts pale buff; underparts clear white; membranes blackish, except for white edging on wings and on interfemoral membrane. Total length, 3.5 inches; tail vertebræ, 1.7 inches; hind foot, .36 inch; forearm, 1.5 inches. Has been taken on Mt. Whitney, California (11,000 feet) and at Mammoth, Mono County, California.

Alberta Little Brown Bat.—*Myotis pernox* Hollister.

Closely resembling typical *lucifugus* externally, but foot larger and membranes blacker. Upperparts uniform glossy brown; underparts deep yellowish gray. Total length, 3.7 inches; tail vertebræ, 1.6 inches; hind foot, .46 inch; forearm, 1.55 inches. Taken at Henry House, Alberta.

Northern Little Brown Bat.—*Myotis altifrons* Hollister.

Size of typical *lucifugus* but differing in color. Wing attachment to hind feet at base of toes; tragus long and narrow. Upperparts very dark brown; underparts dark drab brown; membranes blackish. Total length, 3.6 inches; tail vertebræ, 1.6 inches; hind foot, .36 inch; forearm, 1.46 inches. Taken at Henry House, Alberta.

Least Brown Bat.—*Myotis winnemana* Nelson.

Resembling typical *lucifugus* but differing in shorter forearm and ear and blackish muzzle. Upperparts dark rufous chestnut-brown tinged with golden; blackish on muzzle and sides of head; underparts dull grayish brown. Total length, 3.3 inches; tail vertebræ, 1.6 inches; hind foot, .32 inch; forearm, 1.22 inches; wing expanse, 11 inches. Taken at Plummer Island, Maryland and at Brandon, Vermont.

Yellowstone Bat.—*Myotis carissima* Thomas.

Resembling typical *lucifugus* (regarded as a subspecies of *lucifugus* by Bailey). "Ears, small and pointed; fur, glossy; colors, light hazel-brown above, buffy below; ears and membranes, dark brown or blackish; tail membranes, edged with gray." (Bailey, *N. A. Fauna*, No. 49, p. 215). Total length, 3.8 inches; tail vertebræ, 1.6 inches; hind foot,

.4 inch; forearm, 1.5 inches; wing expanse, 10.4 inches. Found from "western Montana to the Black Hills and over western North Dakota." (Bailey)

Northwestern Long-legged Bat.—*Myotis longicrus longicrus* (True).

Resembling typical *lucifugus* but a trifle larger and with proportionally shorter ear and forearm. Upperparts bister sprinkled with lighter tipped hairs; underparts washed with vinaceous buff. Total length, 4 inches; tail vertebræ, 1.8 inches; hind foot, .32 inch; length of forearm, 1.5 inches. Found in "Boreal and Transition Zones from Puget Sound east to Wyoming; south at least to Arizona and southern California, and probably much farther. [The range as here given is that of the entire species.]" (Miller)

Interior Long-legged Bat.—*Myotis longicrus interior* Miller.

Differing from typical *longicrus* in being tawny olive instead of bister. Has been taken in Idaho, Wyoming, Colorado, Nevada, New Mexico, and Arizona.

Little California Bat.—*Myotis californicus californicus* (Audubon and Bachman).

Smallest of the *Myotis* found in the United States and characterized by "slender form, delicate membranes, long tail and legs, small feet, and pale yellowish color." (Miller) Ears reaching just beyond tip of nose when laid forward, tragus slender, more or less straight, pointed. Upperparts light yellowish gray; underparts paler; membranes blackish. Total length, 3.2 inches; tail vertebræ, 1.5 inches; hind foot, .25 inch; forearm, 1.25 inches. Found in "Austral Zones and lower part of Transition Zone throughout the western United States and Lower California; east to Wyoming and Texas." (Miller)

Little Pallid Bat.—*Myotis californicus pallidus* Stephens.

Resembling typical *californicus* but slightly smaller and paler. Upperparts light buff, pelage blackish at base; underparts pale buff; membranes light brown. Total length, 3.2 inches; tail vertebræ, 1.6 inches; hind foot, .3 inch; forearm, 1.2 inches. Found in California in "Lower Sonoran Zone on the Colorado and Mohave deserts, and north in Owens Valley at least to Lone Pine." (Grinnell)

Oak Foliage Bat.—*Myotis californicus quercinus* H. W. Grinnell.

Intermediate in color between typical *californicus* and *pallidus*. Upperparts cinnamon; underparts light buff. Total length, 3.2 inches; tail vertebræ, 1.45 inches; hind foot, .24 inch; forearm, 1.3 inches. Found in Southern California and the Santa Barbara Islands in Upper Sonoran and low Transition Zones.

Northwestern Little Brown Bat.—*Myotis californicus caurinus* Miller.

Very much darker than typical *californicus*. Upperparts very dark, "almost blackish sepia throughout, slightly

LITTLE BROWN BAT

yellowish on belly, the fur everywhere blackish plumbeous at base." (Miller) Total length, 3 inches; tail vertebræ, 1.2 inches; hind foot, .28 inch; forearm, 1.3 inches. Found in "The humid coast district of British Columbia, Washington, and Oregon, and possibly of northern California also." (Miller)

Prairie Little Brown Bat.—*Myotis californicus ciliolabrum* (Merriam).

Paler than typical *californicus* and with slightly larger ears; interfemoral membrane thinly haired on upper surface for about half its extent from body, about one-fifth its extent on under surface. Upperparts pale yellowish white in marked contrast to dark brown of ears, muzzle, and chin. Total length, 3.2 inches; tail vertebræ, 1.4 inches; hind foot, .28 inch; forearm, 1.3 inches. Found in Kansas and South Dakota; limits of range unknown.

La Grulla Brown Bat.—*Myotis orinomus* Elliot.

Like typical *californicus* externally but larger and with longer thumb; tragus tall, slender, tapering and rounded at tip; pelage soft and silky. Upperparts tawny olive; underparts pale buffy; membranes dark brown. Total length, 3.4 inches; tail vertebræ, 1.6 inches; hind foot, .28 inch; forearm, 1.3 inches. Found in southern California in the high Upper Sonoran Zone.

Yuma Bat.—*Myotis yumanensis yumanensis* (H. Allen).

Size small; ear reaching just beyond tip of nose when laid forward; tip of ear narrow and abruptly rounded; tragus slender, sharply pointed; hind foot proportionally large; calcar long. Upperparts pale wood-brown or buff; underparts whitish; membranes light brown and rather thick for such a small Bat. Total length, 3.4 inches; tail vertebræ, 1.5 inches; hind foot, .68 inch; forearm, 1.4 inches. Found in "Austral Zones and lower edge of Transition Zone from the southwestern United States to San Luis Potosi and Michoacan, Mexico." (Miller)

Tejon Bat.—*Myotis yumanensis sociabilis* H. W. Grinnell.

Intermediate between typical *yumanensis* and *saturatus*. Upperparts wood-brown; underparts light buff; pelage everywhere clove-brown at base. Total length, 3.3 inches; tail vertebræ, 1.35 inches; hind foot, .33 inch; forearm, 1.4 inches. Found in "the semi-arid Transition and Sonoran Zones in California west and north of the southeastern deserts." (Grinnell); taken also on Mt. Whitney, 11,000 feet.

Miller Bat.—*Myotis yumanensis saturatus* Miller.

Resembling typical *yumanensis* but with longer fur and darker color; smaller than typical *lucifugus* which it resembles in color. Upperparts dark glossy yellowish brown; underparts old gold; sides, chin, and throat darker than underparts; membranes blackish; pelage everywhere slaty black at base. Total length, 3.2 inches; tail vertebræ, 1.4

inches; hind foot, .34 inch; forearm, 1.4 inches. Found in "Transition Zone in Oregon, Washington, and British Columbia." (Miller)

Cave Bat.—*Myotis velifer* (Allen).

The largest species of the genus found in the United States: ears short and pointed. Upperparts uniform dull sepia; underparts somewhat paler; pelage everywhere slate-colored at base. Total length, 4 inches; tail vertebrae, 1.6 inches; hind foot, .4 inch; forearm, 1.6 inches. Found along the southern border of the United States.

Bailey Little Brown Bat.—*Myotis baileyi* Hollister.

Most like *velifer* but smaller, forearm shorter; tragus broad at base and sharply pointed; larger than *occultus*, ears larger. Sepia above, smoke-gray below; membranes black. Forearm, 1.6 inches; hind foot, .6 inch. Has been taken only at Ruidoso and Luna, New Mexico.

Little Gray Bat.—*Myotis grisescens* Howell.

Most nearly related to *velifer* but darker in color and wings attached to feet at ankle joint instead of at base of toes. Upperparts dark mouse-gray, the hairs one color from tips to roots; underparts pale smoke-gray, the hairs darker basally; membranes black. Total length, 3.7 inches; tail vertebrae, 1.5 inches; hind foot, .42 inch; forearm, 1.65 inches. Found in Tennessee, Missouri, and Indiana.

San Antonio Little Brown Bat.—*Myotis incantus* (Allen).

A large species about the size of *velifer*. Upperparts dull light brown with a tinge of olive; underparts grayish washed with buffy; membranes blackish brown. Total length 3.75 inches; tail vertebrae, 1.75 inches; forearm, 1.7 inches; expanse, 11.1 inches. Known from various localities in New Mexico and Texas, from Carlsbad, New Mexico to Bexar County, Texas.

Say Bat.—*Myotis subulatus subulatus* (Say).

Not unlike typical *lucifugus* externally but with longer ears which reach well beyond tip of nose when laid forward. Darker than *evotis* and ears narrower; pelage soft and lax. Upperparts yellowish brown; underparts slightly paler; membranes dark brown. Total length, 3.8 inches; tail vertebrae, 1.6 inches; hind foot, .36 inch; forearm, 1.5 inches; wing expanse, 10 inches. Found irregularly distributed in North America east of the Rocky Mountains.

Keen Bat.—*Myotis subulatus keenii* (Merriam).

Darker than typical *subulatus* and with longer tail and ears. Total length, 3.4 inches; tail vertebrae, 1.6 inches; hind foot, .33 inch; forearm, 1.4 inches. Found on Queen Charlotte Islands, British Columbia, and probably on adjacent mainland.

Little Long-eared Bat.—*Myotis evotis* (H. Allen).

Size medium; ears very large, naked and black; fur glossy, soft and lax. Upperparts buffy yellowish; paler, almost whitish, on underparts; membranes blackish. Total

LITTLE BROWN BAT

length, 3.6 inches; tail vertebræ, 1.7 inches; hind foot, .36 inch; forearm, 1.6 inches; ear from notch, .8 inch. Found in "Austral and Transition Zones from the Pacific coast to the eastern edge of the Rocky Mountains; south to Vera Cruz, Mexico." (Miller)

Hollister Bat.—*Myotis occultus* Hollister.

Differs from other North American species of *Myotis* in low, flat braincase and wide, flat rostrum. Upperparts rich glossy brown with cinnamon tint; underparts paler, tinged with buffy. Total length, 3.6 inches; tail vertebræ, 1.6 inches; hind foot, .6 inch. Found along the west side of the Colorado River from Needles, California to Yuma; limits of range unknown.

Fringed Bat.—*Myotis thysanodes* Miller.

A large species with moderately long ears (which reach about a quarter of an inch beyond tip of nose when laid forward), wing attached to hind foot at a point between ankle and base of toes, free border of interfemoral membrane thickened and densely haired. Upperparts dull yellowish brown; underparts paler; membranes dark. Total length, 3.5 inches; tail vertebræ, 1.5 inches; hind foot, .32 inch; forearm, 1.65 inches. Found in "Lower Sonoran Zone from near the southern border of the United States to San Luis Potosi and Michoacan, Mexico." (Miller)

* * * * *

Some species of this genus is usually the commonest small Bat of any given region. The genus is almost cosmopolitan in distribution, being found over a large part of both the Eastern and Western Hemispheres, and some one of the many American forms is generally to be seen at dusk anywhere in North America where Bats can find flying insects. *Myotis* can generally be told by its small size, the only other North American Bat as small being *Pipistrellus*. These two genera, however, can probably not be distinguished on the wing by the layman.

The flight of *Myotis* is fairly rapid, but because of the ample membranes is more a series of full-winged flutterings than the rapid beats of some of the more narrow-winged Bats such as *Tadarida*. The flight is quite erratic and as a rule the Bat flies at no great height above the ground. It is difficult to observe when the light becomes dim because it seldom comes against the sky-line unless directly overhead.

The voice of this Bat is a very fine, wiry squeak, and attention is often directed to the presence of *Myotis* by this note which, however, is pitched so high as to be inaudible to some individuals.

Myotis spends the day in caves and, when these are not available, in hollow trees or under the eaves and in the roofs of buildings where they are not disturbed.

Myotis may be seen flying in a great many environments, but is observed to best advantage at the edge of a forest clearing, over the surface of a lake or a slow-flowing stream, or at the opening of any natural tunnel such as a foliage-enclosed corridor under the trees, under bridges, or near an open shed or barn. This Bat often flies into houses if the doors or windows are open.

I believe that the Bats of this genus generally have but one young at a birth.

Genus *Lasionycteris*

Dentition.—Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{3}$; Molars, $\frac{3}{3}$ = 36.

Silver-haired Bat.—*Lasionycteris noctivagans* (Le Conte)

Names.—Silver-haired Bat; Silvery-haired Bat; Black Bat.

General Description.—A medium-sized Bat of dark appearance, the hairs tipped with silvery white. Ear of medium size, broad, rounded at tip; tragus short, straight and broad; interfemoral membrane well furred on basal half of upper surface.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts dark chocolate-brown tipped with silvery white; pelage long and lax; membranes dark brown; underparts very much like upperparts but with less light-tipping.

Measurements.—Total length, 4 inches; tail vertebræ, 1.6 inches; hind foot, .32 inch; ear from crown, .6 inch; forearm, 1.6 inches.

Geographical Distribution.—"North America north of Mexico, from the Atlantic to the Pacific; probably not breeding south of the Transition Zone." (Miller)

Food.—Flying insects.

Enemies.—Owls.

The genus *Lasionycteris* is peculiar to North America and only the one species is known. Although this Bat ranges over most of North America its distribution is somewhat

PIPISTRELLE

irregular, and over large areas it is absent or very rare. It seems to prefer the banks of forested streams or mountain meadows where it appears when twilight has set in.

This Bat migrates southward from the colder parts of its range upon the approach of autumn and during this time may be seen occasionally flying during the day. This species spends the day in hollow trees, in dense masses of foliage, or in caves.

The young may be one or two in a litter.

Genus *Pipistrellus*

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{4}$; Premolars, $\frac{2}{2}$; Molars, $\frac{3}{3}$ = 34.

Pipistrelle.—*Pipistrellus subflavus*

and related forms

Names.—Pipistrelle; various names for the different species, such as Western Bat for *P. hesperus*.

General Description.—Among the smallest of the North American Bats; ear of medium size, broad, rounded at tip; tragus straight or slightly curved forward, tip bluntly rounded; interfemoral membrane sparingly sprinkled with hair on basal third of upper surface; membranes blackish.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts light yellowish brown, underparts very much like upper or slightly paler; pelage everywhere slaty black at base.

Measurements.—Total length, 3.4 inches; tail vertebræ, 1.6 inches; hind foot, .32 inch; forearm, 1.3 inches.

Geographical Distribution.—Eastern United States.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Pipistrellus*

Georgian Bat.—*Pipistrellus subflavus subflavus* (F. Cuvier).

As described above; ear reaching slightly beyond nostril when laid forward. Found in the eastern United States from Atlantic coast to Iowa and eastern and southern Texas, in Austral and occasional parts of Transition Zone.

New York Pipistrelle.—*Pipistrellus subflavus obscurus* Miller.

Duller and less yellow than typical *subflavus* and with more

dark-tipped hairs on back. Upperparts pale wood-brown; underparts pale yellowish gray. Total length, 3.4 inches; tail vertebræ, 1.55 inches; hind foot, .32 inch; forearm, 1.4 inches. Found "Along border of Transition Zone and Upper Austral Zone in central and eastern New York." (Miller)

Western Bat; Canyon Bat.—*Pipistrellus hesperus hesperus* (H. Allen).

Smallest of North American Bats; ear short (barely reaching to nostril when laid forward), bluntly rounded; tragus blunt and inclined forward at tip. Above and below light yellowish gray or whitish gray; pelage slate-colored at base. Total length, 2.9 inches; tail vertebræ, 1.2 inches; hind foot, .22 inch; forearm, 1.2 inches. Found in "Lower Austral Zone in the western United States from southern and western Texas to the Pacific coast. Limits of range imperfectly known." (Miller)

Merriam Bat.—*Pipistrellus hesperus merriami* (Dobson).

Resembling typical *hesperus* but darker in color and slightly larger. Color above and below warm buff. Total length, 3 inches; tail vertebræ, 1.2 inches; hind foot, .22 inch; forearm, 1.15 inches. Found in the Upper Sonoran and Transition Zones from the Mexican line northwest through California, east of the humid coast belt and west of the Sierra Nevada to Butte and Tehama counties.

* * * * *

The species of *Pipistrellus* are very small, erratic flyers and are often found in large numbers in favored localities. These Bats seem to be commonest over the southern part of their range and show a preference for cliffs and rocky hillsides. They are variously recorded as appearing on the wing soon after sunset, at late dusk, and even at 9 A.M.

The number of young is one or two, more often the latter.

The North American forms of *Pipistrellus* live in caves or crevices in the rocks.

Genus *Eptesicus*

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{1}{2}$; Molars, $\frac{3}{3}$ = 32.

Brown Bat.—*Eptesicus fuscus*

and related forms

Names.—Brown Bat; Big Brown Bat; House Bat.

General Description.—A large Bat, brown in color and without any peculiar development of nose, ear, or wing structure. Ear of medium size, narrowly rounded at tip, ear

membranes rather tough and leathery; tragus of medium height, straight and moderately rounded at tip; pelage soft and loose; flight membranes naked; interfemoral membrane ample.

Color.—Sexes colored alike; no marked seasonal variation.

Upperparts uniform brown, varying slightly with individuals from sepia almost to cinnamon-brown; pelage

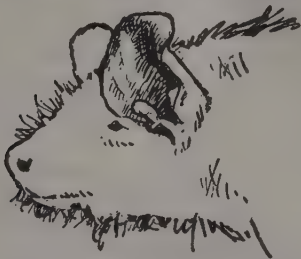


FIG. 15. Head of Brown Bat

blackish at base; membranes blackish; face and ears blackish; underparts somewhat lighter than upperparts, a paler shade of brown with buffy tinge.

Measurements.—Total length, 4.5 inches; tail vertebræ, 1.6 inches; hind foot, .4 inch; forearm, 1.8 inches; wing expanse, 12 inches.

Geographical Distribution.—Most of North America.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Eptesicus*

Common Brown Bat; Big Brown Bat.—*Eptesicus fuscus fuscus* (Beauvois). Plate III.

As described above. Found in "Austral, Transition, and lower edge of Boreal Zones throughout the greater part of the United States and adjoining British Provinces." (Miller)

Eptesicus fuscus melanopterus Rehn

Eptesicus fuscus bernardinus Rhoads

These two races are listed in Miller's *North American Recent Mammals*, but are probably not to be distinguished from typical *fuscus*.

Florida Big Brown Bat.—*Eptesicus fuscus osceola* Rhoads.

Resembling typical *fuscus* but darker in color. Upperparts cinnamon-brown. Total length, 4.5 inches; tail vertebræ, 1.8 inches; hind foot, .4 inch. Found in peninsular Florida.

Colorado Brown Bat; Pale Brown Bat.—*Eptesicus fuscus pallidus* (Young).

Paler and larger than typical *fuscus* but otherwise very much like it. Upperparts brownish ashy; underparts silvery gray. Total length, 5 inches; tail vertebræ, 2 inches; hind foot, .48 inch. Taken at Boulder, Colorado.

* * * * *

Eptesicus is the commonest of the larger Bats found in the United States. Its size and fairly steady flight are good distinguishing characters. Although its flight traces abrupt changes of direction, it is one of the least erratic fliers among the North American Bats. It is not infrequently heard to utter its high-pitched, squeaky call, and is often seen about street lights in large cities where it finds congenial abodes in dark nooks in the roofs or inaccessible crannies in the buildings.

Several observers have stated that in the eastern states the Big Brown Bat does not appear until rather late, but in the West I have noted them as quite early, very shortly after sundown, in fact. This Bat flies fairly high and shows a preference for meadows, clearings in the forest, and over water-courses. It may enter houses through open doors or windows.

The number of young at a birth is one or two. The Big Brown Bat either hibernates or migrates from the regions of cold autumns and winters. In New York City it is not an uncommon thing to come across the Big Brown Bat hibernating in some building.

Genus *Nycteris*

Dentition: Incisors, $\frac{1}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{2}$; Molars, $\frac{8}{8}$ = 32.

Red Bat.—*Nycteris borealis*

and its subspecies

General Description.—A medium-sized Bat of conspicuous reddish coloration. Ears low, broad, rounded; tragus broad at base, tapering at point; pelage long and lax; interfemoral membrane densely furred on upper surface, sparingly furred

for about one-third, on under surface; fur on wing membranes in region of elbow and wrist above and more extensively along arm from body to wrist below. Plate III.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts bright rufous red, the pelage blackish at base, sprinkled with minute, whitish tips to give appearance of delicate frosting; color varies somewhat and specimens may be yellowish gray above, generally with a faint tinge of salmon; a yellowish white shoulder patch present; underparts paler and less reddish than upperparts.

Measurements.—Total length, 4.2 inches; tail vertebræ, 2 inches; hind foot, .3 inch; forearm, 1.6 inches.

Geographical Distribution.—North America from Canada south.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Nycteris*.

Northern Red Bat.—*Nycteris borealis borealis* (Müller).

As described above. Found in "Boreal, Transition, and Austral Zones in eastern North America from Canada to Florida and Texas; west at least to Indian Territory and Colorado." (Miller)

Seminole Red Bat.—*Nycteris borealis seminola* (Rhoads).

Size of typical *borealis* but differing in color. Upperparts rich mahogany-brown slightly frosted with grayish white; whitish areas on throat and chest; whitish shoulder patches. Found in "Lower Austral and Tropical Zones from South Carolina to southern Texas." (Miller)

Western Red Bat.—*Nycteris borealis teliotis* (H. Allen).

Smaller than typical *borealis*, with shorter ear and brighter color. Upperparts cinnamon reddish to ochraceous buff. Total length, 4.1 inches; tail vertebræ, 1.9 inches; hind foot, .32 inch; forearm, 1.6 inches. Found "From the head of Sacramento Valley, California, south to Comondu, Lower California." (Miller)

Hoary Bat.—*Nycteris cinerea* (Beauvois)

Names.—Hoary Bat; Great Northern Bat.

Similar in general structure to its congener, the Red Bat, in the following characters: broad, low ear which is furred almost to the tip, rimmed with black; tragus broad basally; pelage long and lax; interfemoral membrane heavily furred

above; wings furred along forearm as far as wrist on underside. Larger than the Red Bat and gray instead of reddish in color.

Upperparts grayish white, with darker basal color of pelage showing through; hairs brownish black at base, then pale yellowish brown, followed by a narrow band of chocolate-brown and finally tipped with whitish. Underparts yellower and without so much of the white tipping except on throat where long hairs form a sort of ruff colored like back. Membranes brownish black except for a narrow yellowish brown strip along forearm and half way down fingers on upperside.

Total length, 5.5 inches; tail vertebræ, 2.2 inches; hind foot, .2 inch; forearm, 2 inches; wing expanse, 16 inches.

Found in "Boreal North America from Atlantic to Pacific, breeding within the Boreal Zone, but in autumn and winter migrating at least to southern border of United States." (Miller)

* * * * *

The Red Bat is more of a tree Bat than the other North American Bats and is consequently never found away from the forests, except possibly during migration. It spends the daytime hanging amongst the leaves and it rather closely resembles a dead and brown leaf. It is said to be solitary in habit and only one or two are found together.

This Bat appears in the air rather early in the evening and is not infrequently seen abroad in the daytime. It enters houses in pursuit of insects just as does *Eptesicus* and *Myotis* and can be readily identified by its very distinctive reddish color.

The Red Bat is a very rapid flyer and follows an erratic course fairly well up above the ground. The rapidity of flight, large size, and long narrow wings are the best field characters.

Bats of this genus have four mammæ and the number of young at a birth varies from one to four. If the mother has four young the combined weights of her offspring may exceed her own weight; and, since she carries them with her until they are able to fly for themselves, it indicates very marked powers of flight.

The Hoary Bat is like the Red Bat in its preference for forests, its long pointed wing, swift, erratic flight, and the

number of young, (often four), but differs in its greater size, gray instead of reddish color, later appearance in the evening, and generally higher course of flight. This Bat is not common anywhere and does not take to the air until the twilight is nearly past. It is one of the least known of our widely ranging Bats. A specimen in the hand can not be mistaken for any other species and it is easily the most handsome North American Bat.

There are many observations on record to show that the species of *Nycteris* migrate with the coming of the autumn frosts.

Genus *Dasypterus*

Dentition: Incisors, $\frac{1}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{1}{2}$; Molars, $\frac{3}{3}$ = 30.

Yellow Bat.—*Dasypterus intermedius*

and related species

General Description.—Very much like *Nycteris* in general characters. Ear of medium height, rather broad and rounded, only sparsely sprinkled with hairs on inner surface, furred about half way on outer surface; tragus broad basally, tapering at tip; interfemoral membrane well haired above for about basal third, naked below; a sprinkling of fur on underside of volar membranes along forearm to wrist; pelage long and silky.

Color.—Sexes colored alike, no noticeable seasonal variation.

Upperparts pale yellowish brown more or less mottled by dusky-tipped hairs; pelage blackish at base; membranes brownish to blackish; underparts warmer in tone than upperparts and washed with rusty brown on lower abdomen.

Measurements.—Total length, 5.8 inches; tail vertebræ, 2.6 inches; hind foot, .4 inch; forearm, 2.2 inches.

Geographical Distribution.—Southern states from Texas east.

Food.—Flying insects.

Enemies.—Owls.

Species of the Genus *Dasypterus*

Only two species reach the United States, the genus having a wider distribution south of the United States.

Texan Yellow Bat.—*Dasypterus intermedius* (H. Allen).

As described above. Found in "Mexico from Chiapas north to extreme southern Texas." (Miller)

Florida Yellow Bat.—*Dasypterus floridanus* Miller.

Smaller than *intermedius* but colored the same. Total length, 5 inches; tail vertebræ, 2.5 inches; hind foot, .36 inch; forearm, 1.9 inches. Found in "Florida and Gulf coast west to Louisiana." (Miller)

* * * * *

Very little has been written about this Bat which apparently is not very common anywhere. This genus is southern in its distribution and ranges down into South America. The different species apparently prefer dry, hot country. The number of young is two at a birth and they are born in late May (Texas).

Genus *Nycticeius*

Dentition: Incisors, $\frac{1}{2}$, Canines, $\frac{1}{2}$; Premolars, $\frac{1}{2}$; Molars, $\frac{3}{2}$ = 30.

Rafinesque Bat.—*Nycticeius humeralis* (Rafinesque)

Names.—Rafinesque Bat; Evening Bat.

General Description.—A small to medium-sized Bat with very much the external appearance of a large *Myotis* or a small *Eptesicus*. Ear small, thick and leathery, naked, rounded in anterior profile, tip moderately narrow and rounded; tragus short and blunt; pelage not extending onto membranes, rather short.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts dull brown, the pelage brownish black at base; membranes blackish; underparts lighter and more buffy than upperparts.

Measurements.—Total length, 3.7 inches; tail vertebræ, 1.5 inches; hind foot, .28 inch; forearm, 1.4 inches.

Geographical Distribution.—Found in "Austral Zones in the eastern United States, west to Arkansas and southern Texas." (Miller)

Food.—Flying insects.

Enemies.—Owls.

* * * * *

SPOTTED BAT

This Bat is a member of a small genus peculiar in many characters which set it off from other North American Bats. Not very much has been recorded on the habits of *Nycticeius* and it is apparently not very common over parts of its range, although elsewhere it may be fairly abundant, as in eastern and southern Texas.

Harper (*Mammals of Okefinokee Swamp*) writes of this Bat in Georgia:

"These bats have also been found roosting in a hollow tree in a cypress bay, as mentioned below. They are observed for the most part during the last half hour of daylight, generally at a height of perhaps 40 to 75 feet. As darkness falls, however, they come much closer to the ground, so that occasionally specimens may be knocked down with a reed fishing-pole."

Genus *Euderma*

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars $\frac{2}{2}$; Molars, $\frac{3}{3}$ = 34.

Spotted Bat.—*Euderma maculata* (Allen)

Names.—Spotted Bat; Jackass Bat.

General Distribution.—A good-sized Bat with very large ears and peculiar spotted coloration. Ears enormous, joined across forehead by a low band, marked by transverse ridges, about fifteen in number; tragus tall, broad, and bluntly rounded at tip; pelage long and soft; membranes thin and papery; face without any glandular swellings.

Color.—Sexes colored alike.

Upperparts dark chocolate-brown, almost black, with a large, irregular white spot on each shoulder and on rump; underparts washed with white over chocolate-brown basal pelage; membranes light yellowish brown.

Measurements.—Total length, 4.5 inches; tail vertebrae, 2 inches; hind foot, .36 inch; forearm, 2 inches.

Geographical Distribution.—Southwestern states; a very rare Bat of which very few have ever been taken; taken at Piru, Ventura County, and Mecca, Riverside County, in California; Yuma in Arizona; and Mesilla Park in New Mexico.

Food.—Flying insects.

Enemies.—Presumably Owls.

* * * * *

Very little is known of the habits of this Bat which is the rarest of all the Bats found in the United States. The few specimens secured have been taken under unusual circumstances, the type specimen was found on a fence, the second specimen, taken thirteen years later, was found dead in a biological laboratory, and another specimen was found dead lying in a puddle formed by an overflow from a railway water tank. Apparently there is something peculiar about its hours or place of flight to account for the fact that this Bat is not seen flying at dusk with other Bats and is only taken as the result of some accident.

The large ears, and peculiar black and white color pattern, at once distinguish the Spotted Bat from all other North American Bats.

Genus *Corynorhinus*¹

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{3}$; Molars, $\frac{3}{3} = 36$.

Lump-nosed Bat.—*Corynorhinus rafinesquii*

and related forms

Names.—Lump-nosed Bat; Big-eared Bat.

General Description.—A good-sized Bat with peculiar lump-like, warty outgrowth on muzzle, and very large ears. Ears much longer than head, joined across forehead, tips narrow; tragus long and slender; nostrils opening upward and surmounted by prominent glandular masses; tail less than half total length of animal; interfemoral membrane wide; pelage soft and color pattern simple.

Color.—Sexes colored alike.

Clove-brown on back, wood-brown on sides; whitish at base of ear; underparts pale pinkish buff; pelage everywhere gray or slaty gray at base, not strongly contrasted with color on tips of hairs.

Immature pelage dark hair-brown to fuscous above, pale hair-brown below, dirty whitish on abdomen.

Measurements.—Sexes equal in size. Total length, 4.3 inches; tail vertebræ, 2 inches; hind foot, .48 inch; wing expanse, 12.8 inches.

¹ For a full revision of this genus see G. M. Allen, *Bulletin Museum Comparative Zoölogy*, Vol. LX, pp. 333-356, 1916

LUMP-NOSED BAT

Geographical Distribution.—Southeastern states to Vancouver Island and south into Mexico on the west.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Corynorhinus*

Rafinesque Lump-nosed Bat.—*Corynorhinus rafinesquii rafinesquii* (Lesson).

As described above. Found in "Central eastern United States from extreme western Virginia, through Kentucky, southern Indiana and Illinois, to Kansas, intergrading with the race *pallescens* to the westward." (G. M. Allen)

Pallid Lump-nosed Bat.—*Corynorhinus rafinesquii pallescens* (Miller).

Smaller than typical *rafinesquii* and paler. Upperparts pinkish buff; whitish patch back of ear; underparts pale ochraceous buff; pelage everywhere gray to slate-gray basally except on mid-throat where the hairs are colored alike from root to tip. Total length, 4.1 inches; tail vertebræ, 2 inches; hind foot, .36 inch; wing expanse, 12 inches. Found in "Western United States from western Texas, Colorado, and southwestern South Dakota, to the Pacific coast of southern California." (G. M. Allen)

Townsend Lump-nosed Bat.—*Corynorhinus rafinesquii townsendii* (Cooper).

Dark-colored, with base of pelage strongly contrasting in color with tip. Upperparts uniform warm sepia, pelage dark slaty at base; ear patch whitish; underparts washed with pale wood-brown, pelage blackish plumbeous at base. Total length, 3.5 inches; tail vertebræ, 1.9 inches; hind foot .48 inch; ear, 1.44 inches. Found in "The humid coast region from Vancouver Island, British Columbia, southward to San Francisco, California, intergrading with *pallescens* here, as well as in north central California. Inland it extends over most of (?) Washington, Oregon, and the western half of northern California." (G. M. Allen)

Le Conte Lump-nosed Bat.—*Corynorhinus macrotis* (Le Conte).

Differing from the foregoing forms by presence of white-tipped hairs on abdomen. Upperparts cinnamon-brown, pelage slate-colored at base; underparts clear white, basally slate-colored; a sharp contrast between colors of base and tip of hair on upper and lower parts; a whitish ear patch may or may not be present, but usually the posterior base of ear is colored like rest of upperparts. Found in "Southeastern United States, from North Carolina, Georgia and (? northern) Florida, westward through the Southern

and Gulf States, into Louisiana, and probably eastern Texas." (G. M. Allen)

* * * * *

Lump-nosed Bats are easily distinguished from other Bats by their very large ears and the prominent lump on the nose. These Bats prefer to live in caves, although they may use any deep, dark recess such as abandoned mine shafts and tunnels, or even buildings. In favorable localities they may be numerous, and Vernon Bailey found them so in the Carlsbad Cavern, New Mexico, on April 15th, when they were still deep in the winter sleep. The large ears were curled up in spiral coils like a ram's horns, during the dormant period. The members of this genus do not appear to migrate.

The records indicate one young at birth and the time of birth as July or earlier.

Lump-nosed Bats take wing before the twilight is gone.

Subfamily **Nyctophilinae**

Genus **Antrozous**

Dentition: Incisors, $\frac{1}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{1}{2}$; Molars, $\frac{3}{3}$ = 28.

Pale Bat.—Antrozous pallidus

and related forms

Names.—Pale Bat; Big-eared Bat; Desert Pallid Bat.

General Description.—A large Bat with big ears and pale coloration. Ears large and broad, extending considerably beyond end of nose when laid forward, crossed by nine or ten fine transverse lines, tip narrowly rounded; tragus tall, slender and tapering; membranes tough and strong, naked; feet large and strong; nostrils surrounded by a ridge, muzzle rather blunt.

Color.—Sexes colored alike; no seasonal variation in color.

Upperparts pale drab gray, with some dusky-tipped hairs; pelage light-colored to base; membranes brownish; underparts paler than upperparts and lacking the dusky tips to the hairs, except on sides.

Measurements.—Total length, 4.4 inches; tail vertebræ, 1.8 inches; hind foot, .4 inch; ear from meatus, 1.2 inches; forearm, 2 inches.

PALE BAT

Geographical Distribution.—Western and southwestern United States.

Food.—Insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Antrozous*

Pale Bat; Desert Pallid Bat.—*Antrozous pallidus pallidus* (Le Conte).

As described above. Found in "Lower Austral Zone in desert region of eastern California, Nevada, Arizona, New Mexico, and western Texas." (Miller)

Pacific Pale Bat.—*Antrozous pallidus pacificus* Merriam.

Larger than typical *pallidus* and slightly darker. Upper-parts yellowish drab, with heavy wash of brownish on back. Total length, 4.6 inches; tail vertebræ, 1.8 inches; hind foot, .5 inch; forearm, 2.2 inches. Found in "Austral Zones of the western United States and northwestern Mexico." (Miller)

* * * * *

The forms of *Antrozous* are well characterized by their large size, big ears, pale color, and ridge above the nostrils, and are not likely to be confused with any other Bat in the United States.

These Bats live in the roofs of buildings or other darkened nooks in barns, churches, etc., and in crevices in cliffs. They are common in many places and because of their habit of taking up quarters in human habitations may become a nuisance. The flight is not as erratic as that of most Bats, although rapid.

There is evidence to show that these Bats catch some of their prey, such as Jerusalem Crickets, upon the ground, also that they are to some extent, at least, migratory.

The number of young at birth varies from one to three.

Family *Molossidæ*

This family shares with the *Vespertilionidæ* a very high degree of flight specialization. The members of this family may be recognized by the blunt, obliquely truncate muzzle which is generally set with short, specially modified hairs having "spoon-shaped" tips; nostrils terminating in a modified pad which may be fringed with dermal excrescences; ears variable in size and shape, sometimes joined across forehead;

tragus reduced but antitragus generally very large; fifth finger greatly reduced; wing membranes strong, thick, and leathery; the interfemoral membrane narrow, especially so when compared to the Vespertilionidæ; wing surface narrow; tail projecting noticeably beyond interfemoral membrane and earning for this group the name of "Free-tailed" Bats; dentition of normal insectivorous type.

This family occupies among American Bats a position more or less analogous to that occupied by the Swifts among the



FIG. 16. Free-tailed Bat

birds, as far as outward manifestations of flight ability are concerned. The Free-tailed Bats, with their narrow, pointed wings, progress through the air with rapid wing beats which appear to travel through a rather restricted arc. Flight is very rapid and very erratic, and these Bats can be recognized as molossids almost as far as they can be seen. Some of the species (of the genera *Molossus* and *Tadarida*) take wing very early in the evening, often in the late afternoon.

This family is much more tropical in its distribution than the Vespertilionidæ and only a very few forms range far enough north to enter the United States. The molossids that reach

FREE-TAILED BAT

the United States are social in habit, some of them congregating, under favorable circumstances, in very large numbers, and are characterized by a pronounced, musky odor, rather disagreeable in nature. The largest and heaviest of the Bats found in the United States is a molossid, *Eumops californicus*.

Genus *Tadarida*

Dentition: Incisors, $\frac{1}{2}$ or $\frac{1}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{2}$; Molars, $\frac{2}{2}$. = 30 or 32.

Free-tailed Bat.—*Tadarida cynocephala*

and related forms

Names.—Free-tailed Bat, with various qualifying words for the different forms.

General Description.—A medium-sized Bat with tail only partly within the interfemoral membrane and projecting for about half its length; ears low, very broad, tough and leathery, arising from the same point on forehead; tragus very small, flat, truncate; stiff, bristly hairs on face; tiny horny excrescences on inner margins of ears; upper lip wrinkled; wings very narrow, interfemoral membrane reduced; pelage soft and velvet-like, dark in color; foot with long hairs on toes.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts uniform warm brown, near bistre brown, the pelage short and with very short, light-colored base; membranes brownish; underparts lighter than upperparts and with more yellow.

Measurements.—Total length, 4 inches; tail vertebrae, 1 inch; hind foot, .35 inch; forearm, 1.75 inches.

Geographical Distribution.—Southern states.

Food.—Flying insects.

Enemies.—Owls.

Species and Subspecies of the Genus *Tadarida*

This genus is almost cosmopolitan in its distribution, but is essentially a tropical or warm-country group. Only a few forms range north into the southern states, although in Central and South America the Free-tailed Bats are very abundant.

Le Conte Free-tailed Bat.—*Tadarida cynocephala* (Le Conte).

As described above. Found in the southeastern states from Georgia and southern Alabama south and west; limits of range unknown.

Mexican Free-tailed Bat.—*Tadarida mexicana* (Saussure).

Resembling *cynocephala* in external characters. Upperparts hair-brown, paler on underparts. Total length, 4 inches; tail vertebræ, 1.3 inches; hind foot, .4 inch; forearm, 1.7 inches. Found in the southwestern United States from Garfield County, Colorado south into Mexico and from the Pacific east to the middle of Texas.

Pocketed Bat.—*Tadarida femorosacca* (Merriam).

Similar to *mexicana* but larger, tail more than half free of membrane, a fold of membrane from femur to tibia forming pocket. Upperparts dull brown. Total length, 4.1 inches; tail vertebræ, 1.6 inches; forearm, 1.6 inches. Very few specimens of this Bat have ever been taken. The only records I have seen are Palm Springs, Riverside County, Palm Cañon near Palm Springs, California, and Fort Huachuca, Arizona.

Tacubaya Free-tailed Bat.—*Tadarida depressa* (Ward).

Size large; ears united at bases; prominent swelling between eye and nostril. Upperparts dull brown; underparts lighter. Total length, 5.6 inches; tail vertebræ, 1.60 inches; hind foot, .52 inch; forearm, 2.4 inches. Found from Mexico City north to Iowa, but has been collected only a few times. There are records from Arizona, Nevada, Colorado, Iowa, and California, one specimen each, except for Iowa two.

* * * * * * *

The Free-tailed Bats are easily recognized by the mouse-like tail which projects beyond the interfemoral membrane, and by the very narrow wings. The small species of *Tadarida* are the most rapid flyers of all the North American Bats, rowing through the air with rapid wing beats and rather suggestive of Swifts in their mode of flight. These Bats are firm and compact in build, with heavier bodies than the same-sized Bats of the family Vespertilionidæ and appear to be more highly specialized as aerial projectiles. The flight, while broken by abrupt changes of direction, may be quite direct for intervals of many yards.

These Bats are "house" Bats, colonies of many hundreds sometimes taking up abodes in buildings where darkened nooks are accessible. In San Antonio, Texas, municipal bat roosts have been erected to encourage *Tadarida mexicana* and large colonies have established themselves there. The purpose of attracting these Bats was to bring in an enemy of the mos-

quito. Dr. Charles A. R. Campbell of San Antonio has written a book on municipal bat roosts and believes that they are an asset, but Dr. E. W. Nelson, formerly Chief of the U. S. Biological Survey, and other observers question the value of Bats as a mosquito control.

Genus *Eumops*

Dentition: Incisors, $\frac{1}{2}$; Canines, $\frac{1}{4}$; Premolars, $\frac{2}{3}$ or $\frac{1}{2}$; Molars, $\frac{2}{3}$ = 30 or 28.

California Mastiff Bat.—*Eumops californicus* (Merriam)

Names.—California Mastiff Bat; Bonnet Bat.

General Description.—Largest of the Bats found in the United States. Body large and robust, wings small and narrow; ears very large, low, broad, and joined to one another across forehead; a well-developed keel extending across ear to form a broad shelf over eye; tragus small and flat; ear membranes tough and leathery; pelage short and velvety to the touch; a thin strip of hair along upperside of forearm, membranes otherwise naked; long hairs on toes.

Color.—Sexes colored alike; no marked seasonal variation.

Upperparts everywhere sooty brown, pelage lighter at base; membranes brownish black; underparts only slightly paler than upperparts.

Measurements.—Total length, 6.5 inches; tail vertebræ, 2 inches; hind foot, .72 inch; forearm, 2.9 inches.

Geographical Distribution.—Found in southern California and Arizona east into southern Texas, in the Lower Sonoran Zone; rather local in its distribution.

* * * * * * *

Only the one species of *Eumops* is found as far north as the United States; this genus is southern in its distribution. The California Mastiff Bat is much the largest and strongest Bat found in the United States and on the mere basis of size may be readily identified. The large ears which overhang and completely hide the head and face from above are another infallible character.

This Bat has been taken only at a few localities and appears to be sporadic in distribution. Most of the specimens have been found in or about buildings.

Order CARNIVORA. CARNIVOROUS OR FLESH-EATING MAMMALS

Placental mammals, small to large in size, with following characters: feet bearing claws; dentition modified for a flesh diet; brain rather highly developed (cerebral hemispheres showing distinct convolutions); habit typically terrestrial, rarely aquatic, semi-arboreal or semi-fossorial; condyle of lower jaw articulating transversely; clavicle reduced or absent; stomach simple.

Family Ursidæ. Bears

Size large to very large, largest of the carnivorous mammals; form robust; legs stout and rather short; feet plantigrade, with five digits; tail very short; pelage long and heavy; molar teeth of crushing type with broad, flat crowns; no highly specialized carnassial teeth; terrestrial in habit (except for the Polar Bear which is semi-aquatic).

Genus *Euarctos*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 42.

Black Bear.—*Euarctos americanus*

and related forms

Names.—Black Bear; American Black Bear; American Bear; Common Black Bear; Cinnamon Bear; Brown Bear.

General Description.—A medium-sized Bear of dark coloration, black or dark brown in color; claws of forefeet curved, slightly longer than those of hind feet; facial profile straight, not dished; pelage long and moderately soft.

Color.—Sexes colored alike; some seasonal variation, chiefly in length and glossiness of pelage.

Upperparts varying with the individual and the season from deep glossy black to cinnamon-brown; nose brownish; underparts very much the same as upperparts; sometimes with spot of white on chest.

BLACK BEAR

The pelage is longest and glossiest from the time the Bears go into hibernation until soon after they come out in the spring; in summer the coat may be ragged and dull. Considerable variation in color is shown, and in some regions



FIG. 17. Black Bear

the Brown or Cinnamon Bear may be fairly common; elsewhere the Brown may be very scarce and the Black Bear the prevailing type.

Measurements.—Total length, about 60 inches; tail vertebræ, 5 inches; hind foot, 7.25 inches; height at shoulders, 25 inches. Weight from about 200 to 450 or 500 pounds.

Geographical Distribution.—Most of wooded North America.

Food.—Omnivorous; a great variety of vegetable and animal life: grass, fruit, berries, roots, ants, honey, any mammals or birds it can catch, fish and frogs, carrion.

Enemies.—Practically none when full grown, except under exceptional circumstances.

Species and Subspecies of the Genus *Euarctos*

American Black Bear.—*Euarctos americanus americanus* (Pallas).

As described above. Formerly found over much of eastern North America, but now exterminated in many places; known today in New York and Pennsylvania south to Georgia, north to Ungava, and west to British Columbia and Yukon. Plate IV.

Euarctos cinnamomum (Audubon and Bachman) = *Euarctos americanus americanus*

New Mexico Black Bear.—*Euarctos americanus amblycep* (Baird).

Resembling typical *americanus* but with broader skull, color brown, with hairs tipped with lighter shade. Found in New Mexico.

Kenai Black Bear.—*Euarctos americanus perniger* (Allen).

Very similar to typical *americanus* but differing in having very narrow skull. Color intense black. Found on the Kenai Peninsula, Alaska.

Dall Island Black Bear.—*Euarctos americanus pugnax* (Swarth).

Differing from typical *americanus* in broad and heavy skull, with flattened frontal bones; color black. Found on Dall Island, Alaska.

Queen Charlotte Black Bear.—*Euarctos americanus carlottæ* (Osgood).

Differing from typical *americanus* in larger size and various cranial characters such as longer skull, more elongate rostrum and heavier dentition; color said to be glossy black and the cinnamon phase unknown. Found on Graham Island, Queen Charlotte Islands, British Columbia.

Olympic Black Bear.—*Euarctos altifrontalis* (Elliot).

This Bear is listed as a full species in Miller's *North American Recent Mammals*, but it is undoubtedly a form of *americanus*. It was described as "black, nose tan color"; forehead broad, high and bulging; and was taken on the shore of Lake Crescent, Clallam County, Washington.

Florida Black Bear; Everglade Bear.—*Euarctos floridanus* (Merriam).

Larger than typical *americanus* and wholly black; highly arched frontal region. Weight may reach 500 to 600 pounds. Found from Florida north into Georgia.

Louisiana Black Bear.—*Euarctos luteolus* (Griffith).

Large in size like *floridanus* but with frontal region flat molar teeth very large; color generally black but occurs in the brown phase and may be yellowish brown in worn pelage of that phase. Found from Louisiana into eastern Texas.

Glacier Bear; Emmons Bear; Blue Bear.—*Euarctos emmonsii* (Dall). Plate IV.

Small in size, bluish black in color. Claws short and strongly curved; pelage only moderately long, a mixture of black and gray to give a grizzled appearance; a black dorsal line; muzzle brown. Found near Yakutat Bay, Alaska, in the glacier region of the St. Elias Alps, southeast to Glacier Bay. Said by E. W. Nelson to be only a rare color phase of the American Black Bear.

Kermode Bear.—*Euarctos kermodei* (Hornaday). Plate IV.

A very small Bear, white in color; by some considered to be

GRIZZLY BEAR

an albinistic form of *americanus*. Pure white except for buffy to dull ochraceous wash on head and dorsal line. Found on Gribble Island, British Columbia, and the region about Kitimat Arm of Douglas Channel.

* * * * *

The Black Bear is too well known to call for a discussion of field characters. It may be recognized as far as it can be seen and, brown or black, the generic characters are obvious.

So much has been written on the life-history of the Black Bear that no attempt will be made in this handbook to touch on such data. The reader is referred to the bibliography at the close of the volume.

Black Bears hibernate in the cold portions of their range; the number of young varies from one to three, usually two, and they are very small, helpless, and under-developed when born. These Bears have been exterminated over part of their early range, but in recent years have shown some tendency to reestablish themselves in regions where the measures of conservation have helped them. Except under very exceptional circumstances the Black Bear will not attack man, but rather is so afraid of him that it is very difficult to observe.

Genus *Ursus*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 42.

Grizzly Bear.—*Ursus horribilis*

and related forms

Names.—Grizzly Bear; Silvertip. Plate V.

General Description.—Members of this genus are the largest of the North American carnivorous mammals; head massive; body robust and strong; face "dished-in" to give somewhat concave profile; tail short; claws long, slightly curved, smooth, generally with longitudinal whitish or yellowish streaks which become more prominent with age; color usually brownish or yellowish, sometimes with grayish wash on tips of long hairs of upperparts.

Color.—Sexes colored alike.

Upperparts varying with the individual but generally a light shade of brown or yellowish brown, often with sprinkling of white-tipped hairs; underparts much as upperparts, but without grizzling of light-tipped hairs.

Measurements.—Males, total length, 6 feet to 8 feet 6 inches; tail vertebræ, about 2 inches; hind foot, 10 to 12 inches. Height at shoulder, 3 feet to nearly 4 feet. Weight 350 to



FIG. 18. Grizzly Bear

about 900 pounds; park animals up to 1150 pounds. Females slightly smaller than males.

Geographical Distribution.—Great Plains region and Rocky Mountain region; north into Alaska.

Food.—Omnivorous; wild game when it can be caught, cattle, sheep, hogs, fish, berries, fruit, grass, and roots of various species, ants.

Enemies.—Hunted only by man.

Species and Subspecies of the Genus *Ursus*

The group of Grizzly and Big Brown Bears of North America is a most troublesome one to include in any handbook. The most recent review is by Dr. C. Hart Merriam, who has had the benefit of many years of study and large collections of specimens. This review lists no less than 86 distinct forms, of which 84 are to be found in the geographical area covered by this handbook. A great many of these forms are based upon skulls; the external characters are unknown. To set forth here these 84 species and subspecies of Bears would be to swamp the student and discourage him from any attempt to identify a Grizzly or a Big Brown Bear. Indeed, it is a

GRIZZLY BEAR



Alaska Brown Bear



Grizzly Bear



Black Bear

FIG. 19. Forefeet of Bears to show differences in claws

difficult task for a museum, with a fair-sized collection of these animals, to identify specimens. In the attempt to make this field book complete, a synopsis, more or less brief, was written for each and every one of the 84 forms, but in the final analysis it was discarded in favor of a much briefer, more comprehensive treatment which is open to criticism, it is admitted, but which is far less confusing to the lay reader.

"The differences formerly supposed to exist between the Grizzlies and the Big Brown Bears appear, in the light of the material now available, to distinguish certain groups of species from certain other groups, rather than the Grizzlies collectively from the Big Brown Bears collectively. In other words, the differences between the Grizzlies on the one hand and the Big Brown Bears on the other are neither so great nor so constant as at one time believed. And there are species which in the present state of knowledge can not be positively referred to either group. In fact, it seems at least possible that certain species which appear to belong with the Grizzlies are closely related to certain other species which clearly belong with the Big Brown Bears. The typical Brown Bears differ from the typical Grizzlies in peculiarities of color, claws, skull, and teeth. The color of the former is more uniform, with less of the surface grizzling due to admixture of pale-tipped hairs; the claws are shorter, more curved, darker, and scurfy instead of smooth; the skull is more massive; the fourth lower premolar is conical, lacking the sulcate heel of the true Grizzlies. But these are average differences, not one of which holds true throughout the group. Most of the specimens in museums consist of skulls only, unaccompanied by skins or claws, leaving a doubt as to the external characters; and in old bears the important fourth lower premolar is likely to be so worn that its original form can not be made out. And, worst of all, some of the Grizzlies lack the distinctive type of premolar, leaving only the skull as a guide to their affinities." (Merriam, *North American Fauna*, No. 41, p. 12, 1918.)

Big Plains Grizzly; Silvertip.—*Ursus horribilis horribilis* Ord.

The animal described above. Found on the Great Plains bordering the Missouri River in eastern Montana and the Dakotas; limits of range unknown.

Baird Grizzly.—*Ursus horribilis bairdi* (Merriam).

"Probably a mountain animal, while its neighbor *horribilis*

was a plains species." (Merriam) Found in "Southern Rocky Mountain region from San Juan Mountains, southwestern Colorado, northward through Wyoming to Montana, and perhaps to southeastern British Columbia." (Merriam)

Yakutat Grizzly.—*Ursus nortoni* Merriam.

"Head grizzled yellowish or golden brown; muzzle pale brown; neck and shoulders to middle of back pale buffy from the long whitish buff-tipped hairs, giving the skin viewed from behind a decidedly whitish appearance; hinder back and rump dark, well washed with pale brown tips; lower part of legs and feet dark brown; back of forefeet browner and not so dark; underchin and throat pale soiled buffy whitish." (Merriam) Found at Yakutat Bay, Alaska.

Black Hills Grizzly.—*Ursus rogersi bisonophagus* Merriam.

Size large; claws of moderate length, strongly curved; color of male: "muzzle pale brown (apparently old pelage); head and face blackish, becoming slightly grizzled posteriorly and on lower part of cheeks by wash of yellowish-brown-tipped hairs; entire body, legs, and feet very dark brown overlaid on back by wash of light tips." (Merriam) Taken at "Bear Lodge, Sundance National Forest, Black Hills, northeastern Wyoming." (Merriam)

Southern California Grizzly.—*Ursus magister* Merriam.

"Size of male huge (estimated weight over 1,400 pounds), largest of known Grizzlies, considerably larger than *californicus* of the Monterey region, and even than *horribilis*, the great buffalo-killing Grizzly of the Plains (only equaled by the largest *alexandræ* of Kenai Peninsula); sexual disparity great; skull of female hardly half the bulk of male; skull of male of a rather generalized type; not dished. Claws of old female from head of Trabuco Canyon, Santa Ana Mountains, exceedingly long, strongly curved, mainly yellowish above. Color (old female from head of Trabuco Canyon): General color dusky or sooty all over except head and grizzling of back. Muzzle gray or mouse-brown, palest above; top of head and neck very dark brown, sparsely grizzled with pale-tipped hairs; back dusky grizzled with grayish; legs and underparts wholly blackish." Known from "Santa Ana or Trabuco Mountains, Cuyamaca and Santa Rosa Mountains, and probably San Jacinto Mountains. Believed to be extinct." (Merriam)

"Flesh measurements.—Old male. . . : Height at shoulder from flat of foot, 4 ft. . . . ; total length, snout to tail, 9½ ft. . . . ; sole of largest foot without claws: length 12 in. . . . ; breadth, 8 in. . . . Length of old female from Trabuco Canyon, measured in the flesh by Andrew Joplin, 6 ft. 3 in." (Merriam)

New Mexico Grizzly.—*Ursus horriæus* (Baird).

"Size medium; external characters unknown. Range.—

Parts of New Mexico, south to Casas Grandes, Chihuahua, Mexico; probably extending into eastern Arizona." (Merriam)

Alaska Grizzly.—*Ursus alascensis* (Merriam).

Size small. Found in "Norton Sound region, Alaska (Unalaklik and Shaktolik Hills), southerly over the Nushagak and Kuskokwim Rivers to Chinitna on Cook Inlet. Limits unknown." (Merriam)

Barren Ground Bear.—*Ursus richardsoni* Swainson.

"Size medium; color variable, from yellowish to grizzly brown; foreclaws of medium length, smooth; skull medium or small, with broadly spreading zygomata." Taken on "Shore of Arctic Ocean, on west side of Bathurst Inlet near mouth of Hood River." (Merriam)

Tanana Grizzly.—*Ursus phæonyx* (Merriam).

"Size of male large; of female small (sexual disparity great, much greater than in *dalli*). . . . Upperparts varying from creamy or buffy to dark 'grizzly color'; underparts and muzzle pale brown; legs very dark brown, varying to blackish brown; claws horny and smooth, usually dark but sometimes marked with whitish. Last upper molar of medium size or rather small." Found in "Tanana Mountains between Tanana and Yukon Rivers." (Merriam)

Kidder Bear.—*Ursus kidderi kidderi* Merriam.

Size medium, much smaller than *gyas*, which is found in the same region. "June specimens (in left-over winter pelage): General color yellowish brown, darkest on belly and legs, legs much darker than body. Most of the Kidder bears in the National Zoological Park are pale buffy yellowish, or yellowish cream color." Found in "Alaska Peninsula for its entire length." (Merriam)

Alexander Grizzly.—*Ursus alexandræ* Merriam.

"Size very large; skull long and narrow; rostrum exceptionally broad for a grizzly; pelage very uniform in color, scarcely or not grizzled; claws enormous (second foreclaw of type specimen measuring: length from upper base, 91 mm.; height at base, 25; breadth, 11.5). The longest claw in a specimen collected by Wilson Potter measures 120 mm.; in a male killed by Dall DeWeese, 110 mm. . . . Among the grizzlies it stands alone in the great breadth of the rostrum, which in bears of its size is only exceeded by the widely different *kenaiensis*. *Ursus alexandræ* attains the largest size known among the grizzly bears, the biggest skulls equalling those of the huge *magister* of Southern California.

"Color.—Type, very old male, in fresh short fall pelage: General color pale, almost grayish brown, becoming yellowish brown between ears, contrasting with pale brown of muzzle; legs and feet only slightly darker than back; entire animal remarkably unicolor; under-fur plumbeous, crinkled, and wooly. Another male, killed by Wilson Potter, of Philadelphia, in May, 1912 (belonging to skull No. 181102,

presented by Wilson Potter), is pale buffy inclining to light reddish brown throughout, without grizzly appearance; legs only slightly darker. One killed by Dall DeWeese, of Canyon City, Colorado, September 7, 1897, is described by him as 'grayish-yellow,' with legs and sides chocolate-brown." (Merriam) Found in Kenai Peninsula, Alaska.

Alaska Brown Bear; Dall Brown Bear.—*Ursus dalli* Merriam.

"Size very large; skull without very pronounced characters, although differing sufficiently from its neighbors. General color dark brown, strongly grizzled." Found in "Malaspina Glacier and region northwest of Yakutat Bay, Alaska." (Merriam) Plate V.

Sitka Brown Bear.—*Ursus sitkensis* Merriam.

"Size large; coloration very dark; claws of moderate length, curved, dark blue-black, scurfy; skull broad and massive. Color.—Dark; muzzle dark brown, sometimes chocolate-brown or even sooty, paler in faded summer pelage; head and body very dark brown or even dusky, varying to dull brown in summer, washed on back of head, neck, and shoulders with yellowish or golden." (Merriam) Found on Baranof and Chichagof Islands, Sitka Islands, Alaska.

Shiras Brown Bear.—*Ursus shirasi* Merriam.

"A huge brown bear larger than the largest *sitkensis*; head highly arched; color black, except muzzle, which is dull brown; claws dark blue-black, dull, slightly scurfy (not smoothly polished as in the grizzlies), rather strongly curved and of moderate length (middle claw over curve, 92 mm.; from top of base to apex, 75), fourth and fifth rounded off on outer side. Color.—Entire animal, except muzzle, coal black, showing when examined closely a brownish wash along middle of back; muzzle from nose pad to between eyes dull brown. . . . Restricted to Admiralty Island." (Merriam)

Peninsula Giant Bear.—*Ursus gyas* (Merriam).

"Size huge, either largest living bear or second only to the great Kodiak bear (*middendorffi*). Claws rather long and smooth, dark when young, pale when old. Color variable, from grizzled brown to pale yellowish. Skull of male large, long, and massive, but not highly arched. Sexual disparity great." Found along "Entire length of Alaska Peninsula from Cook Inlet to Isanotski Strait and adjacent Unimak Island." (Merriam)

Kodiak Bear.—*Ursus middendorffi* Merriam.

Size huge. Found on "Kodiak and adjacent islands, Afognak and Shuyak; not known from mainland." (Merriam)

Kenai Giant Bear.—*Ursus kenaiensis* Merriam.

"Size large; appearance that of a big grizzly; coloration rather dark; claws moderately curved, dark, usually marked with whitish streaks on sides and near tip; longest claw in three adults 82-90 mm. Skull broad and massive,

that of male strikingly larger than female. . . . Muzzle pale fulvous-brown; cheeks and forehead similar but hairs longer and with pale tips; ground color of top of head, neck, and back much darker but deeply washed on tips with buffy or buffy whitish, giving these parts the look of a grizzly; legs and feet (but not belly) much darker." (Merriam) Found on Kenai Peninsula, Alaska.

Patriarchal Bear.—*Ursus inopinatus* (Merriam).

Size small. "General color varying from whitish buff to pale yellowish buff (yellowest on back of head and neck), darkening to dull reddish brown on ankles, feet, and median line of belly. The pale body color covers the entire body from between eyes to base of tail and reaches down over thighs and upper parts of legs. Muzzle golden brown, becoming dull fulvous-brown around eyes; top of head from between eyes posteriorly soiled buff; long hairs of cheeks washed with buffy; ears pale buffy. Fur everywhere full, soft, and wooly; basal fur of upperparts varying from grayish to grayish brown, but distal half or more than half, pale buffy, so the animal as a whole appears to be buffy whitish." (Merriam) Taken at Rendezvous Lake, northeast of Fort Anderson, Mackenzie.

* * * * *

As in the case of *Euarctos*, the Black Bears, there is little need to tell how to identify a member of the genus *Ursus*. Everyone recognizes the Big Bears and the bigger they are the more certain one can be that the creature is either a Grizzly or an Alaskan Brown. The differences between these two groups have been set forth elsewhere, page 80.

The true Grizzlies of the southern Rocky Mountain districts and the western plains have become extinct, or nearly so, in most places, but in the north the huge Bears of British Columbia, Alaska, and the offshore islands are still the prized big game of North America. The habits of these Bears have been recorded at length by numerous writers and the reader is referred to the bibliography at the end of this volume.

Genus *Thalarctos*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 42.

Polar Bear.—*Thalarctos maritimus*

and related forms

Names.—Polar Bear; White Bear; Water Bear; Ice Bear.

General Description.—A very large white Bear. Neck long, head proportionally small; pelage very dense.

POLAR BEAR

Color.—Sexes colored alike; no marked seasonal variation. Everywhere white with generally a yellowish suffusion; sometimes brownish white in summer.

Immature purer white.

Measurements.—Males about twenty per cent larger than females. Total length, 84–96 inches; tail, 3.5–5 inches; hind



FIG. 20. Polar Bear

foot, 14.5 inches; weight, 700–1600 pounds, average male 900 pounds, average female 700 pounds.

Geographical Distribution.—Arctic America.

Food.—Omnivorous; principally sea food such as Seals, fish, shrimp, mollusks, seaweeds; and on land, grass, roots, Foxes, Caribou, birds, etc.

Enemies.—Very few apart from man—the Eskimo; probably a few are caught by Killer Whales.

Species and Subspecies of the Genus *Thalarctos*

Knottnerus-Meyer has divided the Polar Bears into a number of geographical races and since these Bears are all very much the same externally the basis of separation is the skull. He gives four different subspecies for North America but it is

to be doubted whether there are four truly distinguishable varieties in the North American Arctic.

Polar Bear.—*Thalarctos maritimus maritimus* (Phipps).

As described above. Found in West Greenland, Ellesmere-land, Hudson Bay, and Arctic coast of Alaska.

Ungava Polar Bear.—*Thalarctos maritimus ungavensis* (Knottnerus-Meyer).

Found in the vicinity of Ungava Bay, Ungava, Canada.

East Greenland Polar Bear.—*Thalarctos eogrænlændicus* (Knottnerus-Meyer).

Found in the region of eastern Greenland.

Labrador Polar Bear.—*Thalarctos labradorensis* (Knottnerus-Meyer).

Found in Labrador.

* * * * *

The Polar Bear, with his white coat and characteristic body form, stands by himself, apart from the other Bears. He has cast aside a dependence upon firm land and is at home in the sea or on drifting ice. He follows the food supply and is unlike the rest of the Ursidæ in his behavior toward man. Accounts agree that very often the great White Bear shows no instinctive fear of man and may even stalk a man the same as a Seal or other natural prey.

The native habitat of the Polar Bear is so far north that comparatively few men have ever seen him there, but he is a common denizen of zoological parks and a familiar species.

The number of young born to the Polar Bear is nearly always two, and the time varies from late December to early January.

Family **Procyonidæ**. Raccoons

Carnivores of small or medium size; five toes on fore- and hind feet; feet comparatively long and slender; gait plantigrade; pads of feet naked; tail long, bushy, and usually annulated; muzzle elongated; molar crowns tuberculate.

Genus **Procyon**

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 40

Raccoon.—*Procyon lotor*

and related forms

Names.—Raccoon; Coon. Plates VI and XVIII.

General Description.—A robust, fair-sized carnivore with long pelage and long, banded, rather bushy, tail. Muzzle long

RACCOON

and slender; head broad across the jowls; ears erect and prominent; form thickset; fore- and hind-feet with five toes bearing non-retractile claws; soles naked, hind feet plantigrade; tail moderately long and bushy, cylindrical; pelage thick and heavy; habit somewhat arboreal; nocturnal.

Color.—Sexes colored alike; some seasonal variation.

Upperparts.—Grizzled gray, brown, and black, the pelage dull brown at base; a black band across forehead and eyes,



FIG. 21. Raccoon

grayish on muzzle and back of ears; ears grayish, with black area at posterior base; sides with less black than dorsal region; tail banded with alternate grayish and blackish, six or seven dark rings; gray of upperparts, except that on head, is strongly mixed with yellowish; hands and feet yellowish gray.

Underparts.—Dull brownish, grizzled with yellowish gray. Immature very much like adults.

Measurements.—Total length, about 30 inches; tail vertebrae, 10 inches; hind foot, 4.5 inches; weight from 15 pounds average up to 49 pounds maximum.

Geographical Distribution.—Most of North America from about 50° latitude south.

Food.—Practically omnivorous: frogs, fish, shell-fish, small mammals, birds, eggs, reptiles, insects, fruit, nuts, corn, etc.

Enemies.—Fisher.

Species and Subspecies of the Genus **Procyon**Subgenus **Procyon****Eastern Raccoon.**—*Procyon lotor lotor* (Linnæus)

As described above. Found in United States east of the Rocky Mountains from southern Ontario and Manitoba to Florida. Plate XVIII.

Florida Raccoon.—*Procyon lotor elucus* Bangs.

Resembling typical *lotor* in size but with longer tail, more rounded ear, more yellowish in color. Upperparts grizzled yellowish and black; patch on shoulders deep orange-rufous. Total length, 35 inches; tail vertebrae, 11 inches; hind foot, 5 inches. Found in Florida and eastern Georgia.

Texas Raccoon; Brown-footed Raccoon.—*Procyon lotor fuscipes* Mearns.

Largest of the Raccoons; resembling typical *lotor*, usually with six black rings on tail; feet dark brown. Upperparts pale gray darkened with black-tipped hairs: nape rusty; black mark on face very extensive. Total length, 36 inches; tail vertebrae, 11.5 inches; hind foot, 5.3 inches. Found in southern Texas, from Devils River south into Mexico.

California Raccoon.—*Procyon lotor psora* (Gray).

By some authors this form is considered to be a full species, *Procyon psora*. Upperparts yellowish gray mixed with black; general color pattern about as in typical *lotor*; tail with five to seven dark bands which are interrupted on lower side except for last two or three; forefeet gray; hind feet dusky, gray on toes and inner edge. Total length, 34 inches; tail vertebrae, 11.8 inches; hind foot, 5 inches. Found in "Lower Sonoran, Upper Sonoran, and Lower Transition Zones throughout California, except the northern border and the southeastern deserts." (Grinnell)

Southwestern Raccoon; San Diego Raccoon.—*Procyon lotor californicus* Mearns.

Resembling *psora* but smaller and paler. Upperparts soiled grayish white mixed with brownish black; nape clay color; fore- and hind feet grayish white; dark rings on tail scarcely discernible on underside. Total length, 32 inches; tail vertebrae, 12.5 inches; hind foot, 4.5 inches. Found in southwestern California.

Pacific Raccoon.—*Procyon lotor pacifica* (Merriam).

Similar to *psora* but darker; black rings on tail not broken on underside. Upperparts drab gray thickly mixed with black. Total length, 37 inches; tail vertebrae, 12.5 inches; hind foot, 4.6 inches. Found on the northwest coast from Puget Sound and the Cascade Mountains of Washington south to Pitt River, Shasta County, California.

Desert Raccoon; Pallid Raccoon.—*Procyon pallidus* Merriam.

Very pale; tail long and slender; color pattern similar to that of *psora*. Upperparts pale gray mixed with black-tipped

hairs; underparts grayish white; hind feet pale gray; dark rings on tail narrow. Total length, 34 inches; tail vertebrae, 12.4 inches; hind foot, 5.2 inches. Found in California in "Lower Sonoran Zone on the Colorado Desert, in Imperial County, and north along the Colorado River at least to Needles." (Grinnell)

* * * * *

The Raccoon has a distinctive color pattern and even if it was not an animal with which most people have become familiar, either through seeing it in Zoos, as fur coats, or as sketched in the press, it could be readily identified from a written description. The combination of the following characters, robust form, ringed tail, and black mask across the eyes, is found in no other North American mammal.

Since the vogue in furs has favored the use of Raccoon fur, the long, loose, gray and black pelage of this mammal has become a favorite for coats. It has long been a popular beast of the chase and in some sections of the country "coon" hunting at night is the high water mark of the year's sport. As a pet the Raccoon takes high rank, although it has somewhat of a penchant for getting into mischief and can not be trusted too much at large.

Raccoons prefer the vicinity of streams, lakes, or marshes and make their homes in hollow trees, hollow logs, or less often in the rocks or in burrows. They are first-class climbers and are not found away from trees or brush. A peculiarity which shows the fondness of these animals for water is the fact that whenever possible they wash their food before eating it. A frog dripping from the stream where it was caught will be washed before the Raccoon eats it.

The Raccoon has a querulous voice which he is not bashful in using. Seton gives the common calls as a "churr" when squabbling for food, snarls and barks when fighting, "err-err-err" when the tame Coon begs for food, and finally a long drawn tremulous "whoo-oo-oo-oo" in the deep of the night, very similar to the call of a Screech Owl.

The number of young in a Coon litter usually is four, but varies from three to six. The young Coons arrive in April to May. Raccoons hibernate during cold weather, remaining dormant for about three months, depending upon the latitude, or in the southern part of their range they may not hibernate at all.

Raccoons are strictly nocturnal in habit and unless disturbed do not come out in the daytime.

The flesh of young Raccoons is said to be good eating, but on this point I have no personal experience.

Family **Bassariscidæ**. . Cacomistles

Resembling the Procyonidæ in most external characters, but differing in dental characters; canines rounded; incisors with small secondary lobes; premolars and molars dog-like, with sharp cusps; claws short, sharp, curved; digits fully webbed or nearly so; feet densely haired to pads.

Genus **Bassariscus**

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 40.

Cacomistle.—**Bassariscus astutus flavus**

and related forms

Names.—Cacomistle; Cacomixtl; Ringtail; Ring-tailed Cat; Civet-cat; Coon-cat; Bassarisk. Plate VI.

General Description.—A small trim-bodied carnivore most nearly related to the Raccoons but much smaller, more slender,



FIG. 22. Cacomistle

pelage shorter and softer, tail longer, and color pattern quite different. Head small; ears large and thinly haired; body slender and lithe; tail about as long as head and body, bushy;

fore- and hind feet furred to pads; five toes on each foot, claws semi-retractile; digitigrade; habit nocturnal.

Color.—Sexes colored alike; no very great seasonal variation.

Upperparts.—General tone grayish brown formed by a mixture of buff, gray, and brownish black, darkest on back, the sides yellowish gray; pelage dark gray at base; blackish about eyes, a small brownish black patch on side of muzzle and in front of ear; tail brownish black with seven white bands.

Underparts.—Buffy white; tail with white bands broader than on upperside and running into one another along mid-line.

Immature very much like adults.

Measurements.—Males, total length, 32 inches; tail vertebræ, 17 inches; hind foot, 2.8 inches. Weight about 2.5 pounds. Females somewhat smaller than males.

Geographical Distribution.—Southern United States from Texas west.

Food.—Small mammals, birds, insects and occasionally fruit.

Enemies.—Probably too active to be caught under ordinary circumstances by the larger carnivores which would prey on it if they could; possibly caught occasionally by Great Horned Owls.

Species and Subspecies of the Genus *Bassariscus*

Texan Cacomistle.—*Bassariscus astutus flavus* Rhoads.

As described above. Found in the western half of Texas north into Colorado and southern Utah and west through New Mexico and Arizona; scattered records from as far east as Louisiana and Alabama.

Western Cacomistle; Oregon Ring-tailed Cat.—*Bassariscus astutus oregonus* (Rhoads). [= *Bassariscus raptor* (Baird)]

Darker than *flavus*. Upperparts wood-brown mixed with blackish; underparts deep buffy. Total length, 30 inches; tail vertebræ, 15 inches; hind foot, 2.7 inches. Found from southern Oregon south through California.

Nevada Cacomistle.—*Bassariscus astutus nevadensis* Miller.

Smaller than *oregonus*; "color peculiar in the clear gray of head in front of ears, and in the reduction of the amount of buff in general tint of neck and anterior half of back, this entire region appearing more ashy than in any other adult specimen in fresh pelage seen; underparts pale cream buff behind fore legs, less pallid anteriorly." (Miller) Total length, female, 25.6 inches; tail vertebræ, 12.4 inches; hind

foot, 2.3 inches. Taken in Eldorado Canyon, Clark County, southern Nevada.

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The Cacomistle is a beautiful little carnivore somewhat suggestive of the Raccoon in the character of banded tail, but more like a Marten in its long, slender body and graceful build. This mammal has such a restricted range in the United States that it is unknown to most people. The name Civet Cat is a misnomer, for this term belongs to the members of the Viverridæ, an Old World family of small carnivores, and should not be used for any North American mammal.

The Cacomistle is strictly nocturnal and moves about only after sundown.

The young are three or four in number and are born in May or June. The nest is usually in a hole in a tree.

Family **Mustelidæ**. Weasels, Martens, Minks, Otters, Skunks, Badgers and Wolverines

Carnivorous mammals very small to medium in size; form typically slender; limbs short; tail variable; feet digitigrade to subplantigrade, digits five in number; anal scent-glands usually present and often highly developed; dentition of shearing-crushing type, well-developed carnassial teeth present; upper molars one on each side; habit terrestrial, semi-arboreal, semiaquatic, or semi-fossorial; pelage often soft and dense, and rating high as fur.

Subfamily **Mustelinæ**. Martens, Weasels, and Minks

Form long and slender; legs short; feet digitigrade, toes partly webbed; tail variable in length, slender or bushy; pelage dense but not especially long; anal scent-gland fairly well developed; habit terrestrial, semi-arboreal or semiaquatic.

Genus **Martes**

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{2}$ = 38

Marten.—*Martes americana*

and related forms

Names.—Marten; Pine Marten; American Marten; American Sable; Hudson Bay Sable. Plate VII.

General Description.—A small carnivore of weasel-like form, a little smaller than a House-cat, with soft, rich pelage, bushy tail, and ochraceous or buffy patches on throat and chest. Head rather small; ears broad and rounded; body long and



FIG. 23. Marten

lithe; limbs short; toes five on each foot, claws sharp and slender; soles densely hairy; tail about half as long as head and body, bushy, cylindrical; habit more or less arboreal.

Color.—Sexes colored alike; no very marked seasonal variation in color.

Upperparts.—Uniform rich yellowish brown mixed with hairs which are dark brown; dark brown on legs and tail; ears edged with whitish; top of head warm brown. Tone of upperparts varies from warm yellowish brown, almost olive, to light buffy brown with ochraceous tinge, and top of head from brown to almost white.

Underparts.—Slightly warmer in tone than upperparts and without the yellowish tinge to the brown; an irregular area of bright ochraceous buff on throat and chest.

Immature very much like adults.

Measurements.—Males larger than females. Total length, males, 23-25 inches; tail vertebræ, 7-8 inches; hind foot, 3.3-3.5 inches.

Geographical Distribution.—Forested parts of northern North America.

Food.—Largely carnivorous; small mammals and birds, such as Squirrels, Chipmunks, Mice, Rabbits, Grouse, and also some nuts, fruit and berries (mountain ash berries are said to be a favorite article of diet), reptiles, frogs, insects, honey.

Enemies.—Able to escape most of the predatory animals that would prey upon it, with the exception of the Fisher, and possibly the Lynx and Great Horned Owl.

Species and Subspecies of the Genus *Martes*

Subgenus *Martes*

American Marten.—*Martes americana americana* (Turton).

As described above. Found in eastern North America from Labrador and the shores of Hudson Bay south to about Virginia (in mountains) and west to Minnesota.

Hudson Bay Marten.—*Martes americana abieticola* (Preble).

Larger than typical *americana*. Upperparts (winter) "rich dark yellowish brown, darkest on middle of back; legs and tail darker, the latter almost black at tip; an irregular blotch and a small spot on chest, ochraceous; face and cheeks grayish brown; ears edged with whitish." (Preble.) Total length, males, 26 inches; tail vertebræ, 8.5 inches; hind foot, 3.8 inches. Found in the region from the western shores of Hudson Bay to Saskatchewan and north to the tree limit.

British Columbia Marten.—*Martes americana abietinoides* Gray.

Upperparts seal-brown, darkest on legs, feet, tail, and middle back; head with more or less grizzling of gray; throat patch ochraceous buff. Total length, females, 23.5 inches; tail vertebræ, 7 inches; hind foot, 3.5 inches. Found in the "Humid interior region of British Columbia, peculiar to the Selkirk and Gold Ranges." (Rhoads)

Alaska Marten.—*Martes americana actiosa* (Osgood).

Much larger than typical *americana*. Upperparts pale ochraceous buff mixed with brown on posterior half, becoming grayer on shoulders; head grizzled grayish and brown; chest patch creamy buff; tail brown darkening toward tip.

Total length, males, 26 inches; tail vertebræ, 8 inches; hind foot, 4.4 inches. Found from the Barren Grounds of Alaska and Yukon south into British Columbia and from the Coast Ranges of British Columbia and Alaska east to meet the range of *abieticola*.

Kenai Marten.—*Martes americana kenaiensis* (Elliot).

Smaller than *actuosa*, tail longer, feet shorter, color darker; often with no yellow patch on throat. Upperparts tawny buff mixed with black, darkest on dorsal region, top of head grizzled; underparts darker than upperparts. Found on the Kenai Peninsula of Alaska.

Newfoundland Marten.—*Martes atrata* (Bangs).

Size of *americana* but color different, suggesting a dark-colored Mink. Upperparts deep chocolate, darkest on back, head, legs, and tail, where it becomes blackish; ear bordered with dull white and with patch of yellowish white in front of opening; irregular ochraceous blotches on throat and belly. Total length, females, 22 inches; tail vertebræ, 7.4 inches; hind foot, 3.5 inches. Found in Newfoundland.

North Labrador Marten.—*Martes brumalis* (Bangs).

Larger than typical *americana* and darker. Upperparts dark brown to almost blackish; head lighter than back. Total length, males, 27 inches; tail vertebræ, 7.8 inches; hind foot, 4.6 inches. Found in "Humid coast region of northeastern Labrador, Ungava Bay to Straits of Belle Isle." (Rhoads)

Pacific Marten.—*Martes caurina caurina* (Merriam).

Resembling *americana* but color a richer shade of brown above and with brighter colored and more extensive throat and breast patches. Upperparts rich brown with suggestion of cinnamon and sprinkling of white hairs; head pale brown; underparts with extensive irregular area of orange-buff from lower jaw more or less to tail. Total length, males, 27 inches; tail vertebræ, 10.8 inches; hind foot, 3.6 inches. Found in the humid coast belt of northern California, Oregon, Washington, and British Columbia, east to Cascade Range.

Rocky Mountain Marten.—*Martes caurina origenes* (Rhoads).

Differing in color from typical *caurina*, head darker, in comparison with body color, ears not edged with white. Upperparts brown, darkest on middle of back, paling on sides; top of head grayish brown; ears edged with ochraceous buff; legs, feet, and tail dark brown; underparts brown marked with extensive irregular areas of buffy ochraceous on throat, chest, and belly. Total length, males, 28 inches; tail vertebræ, 9 inches; hind foot, 3.4 inches. Found in the southern Rocky Mountain region from New Mexico north through Colorado.

Sierra Marten.—*Martes caurina sierræ* Grinnell and Storer.

Paler above and below than typical *caurina*. Sides of face paler; extensive patch of pale ochraceous orange on chest.

Total length, males, 24 inches; tail vertebræ, 7.5 inches; hind foot, 3.2 inches. Found in the Boreal Zone of the whole Sierra Nevada north at least to Mt. Shasta, California.

Queen Charlotte Marten.—*Martes nesophila* (Osgood).

Larger than typical *caurina* which it resembles. Described from skulls only but said to be light colored and short haired. Dentition heavier than that of *caurina* and rostrum shorter. Found on the Queen Charlotte Islands, British Columbia.

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The Marten is the arboreal member of the Weasel family and is such an accomplished climber that it can prey successfully upon Squirrels. If seen at any distance it would probably pass for a large Squirrel in the trees, but near at hand should be recognized by the weasel-like face, with white-edged ears, cylindrical and not flattened tail, and dark yellowish brown color, with orange to yellowish throat patch.

Because of its preference for an arboreal life, the Marten is not found outside of forested areas, and the thicker the woods the better from the Marten's point of view. This mammal is one of the very first to resent the presence of man, and, long before a district is settled, the Martens have disappeared.

In addition to the food it may find in the tree tops, the Marten has much the same habits as the Weasels on the ground and preys on Mice, Hares, Partridges, etc. They are said to be both nocturnal and diurnal, but they are so secretive that one is very seldom seen. They are easy to trap, however, as they are unsuspicious and eager to attack a bait. The fur of the Marten sells for high prices and always commands a good market. The American Marten is close kin to the famous Russian Sable.

The number of young Martens in a litter varies from one to five, with three or four as the average. They are born late in April and are stated to be blind for a long time, over four weeks. The nest which the female makes, lined with grass and moss, is usually in a hollow tree or rarely in a burrow in the ground.

The Marten hisses, growls, snarls, or screeches, according to Seton.

Subgenus *Pekania*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 38.

Fisher.—*Martes pennanti*

and related subspecies

Names.—Fisher; Pekan; Pennant Marten; Black Fox; Blackcat. Plate VII.

General Description.—A large powerful Marten, much larger and darker than the Pine Marten but very similar to it in general structure; pelage long and soft.

Color.—Sexes colored alike; seasonal variation not conspicuous. General tone varying from grayish brown to warm brown, darkest along dorsal region where it may be almost black; nose, feet, and tail blackish; top of head grizzled with gray which extends down neck to shoulders; dark brown on throat, chest, and belly.

Measurements.—Males larger than females. Males: total length, 36-38 inches; tail vertebræ, 15 inches; hind foot, 4 inches; weight, 8 to 12 pounds or up to about 18 as a maximum; weight of females, about 5 pounds.

Geographical Distribution.—Northeastern states and Canada west through Saskatchewan and British Columbia.

Food.—Small mammals, birds, frogs, fish, with some fruit and nuts.

Enemies.—Few in number aside from man. Too agile to be caught by the larger carnivores and said to be able to kill Fox, Raccoon, and Lynx.

Subspecies of Fisher

Fisher—*Martes pennanti pennanti* (Erxleben).

As described. Found formerly from mountains of Virginia north into Quebec and thence westward, but probably to be found today only in Maine and in forested sections north to 50° in Quebec, west through Saskatchewan as far north as 60° and thence through British Columbia to the Pacific, south along the Rockies to Yellowstone Park.

Pacific Fisher.—*Martes pennanti pacifica* (Rhoads).

"Colors variable, ochraceous, chestnut, blackish, etc., lightest on head and shoulders, darkest on rump, tail and legs; these usually rich brownish, black or quite black; skull large, much constricted interorbitally; last upper molar large." (Stephens) Total length, males, 42 inches; tail vertebræ, 14 inches; hind foot, 4.6 inches. Found from the northern part of California north to British Columbia, in forests.

* * * * *

The Fisher is a large Marten and is said to have been so named, in contradistinction to its smaller relative, the Pine Marten, because of its fondness for fish. In appearance it looks like an overgrown black Cat or a black Fox. It is one of the most powerful of the smaller carnivores and one of the most feared members of the Weasel family.

This animal frequents forests, hunting either in the trees or on the ground, and shows some preference for the neighborhood of water or swamps. It is not as aquatic, however, as the Mink. It does not seem to be an abundant mammal anywhere, and with the disappearance of the forests is becoming more scarce. In recent years Fisher fur has been in demand and brought such high prices that this animal has been much sought by trappers.

Different observers have paid tribute to the activity of the Fisher. It is said to be the most active arboreal mammal in North America, able to catch the Pine Marten, and leaping from bough to bough with all the agility of a Squirrel. It is an equally successful hunter on the ground, pursuing prey such as Rabbits, clinging to the trail with persistence until it wears down its victim. It is nocturnal in habit and only rarely moving about by day.

Like the Wolverine, the Fisher may rob trap-lines and destroy the animals which have been caught. It is wary and difficult to trap itself. It is like the Raccoon when chased by Dogs and trees when the Dogs overtake it. It is a very fierce fighter and dangerous to Dogs.

It is one of the very few carnivores to prey with impunity upon the Porcupine, which it kills by overturning and attacking on the unprotected underside.

The young number one to five in a litter, but the usual number is three. The young are born about the first of May and the mother Fisher makes a nest, preferably in a hollow tree at some distance above the ground.

Genus **Mustela**¹

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{2}$ = 34.

¹ For a revision of the Weasels see Merriam, *North American Fauna*, No. 11, 1896.

Weasel.—*Mustela cicognani*

and related forms

Names.—Weasel; Ermine; Stoat; Ferret. Plate VIII.**General Description.**—A slender, long-bodied, short-legged, predatory mammal, small in size. Head small, ears low and rounded, tail short, tipped with black, soles of hands and feet furry. Pelage composed of soft, close underfur and long, hard, glistening, outer hairs; brown of upperparts in sharp contrast

FIG. 24. Weasel

to whitish underparts; summer pelage brown above, winter pelage white all over except for black tip of tail. Habit terrestrial, intensely active, bloodthirsty. Males noticeably larger than females; anal musk-gland capable of secreting a very powerful and disagreeable odor.

Color.—Sexes colored alike.**Upperparts.**—Summer: Uniform chocolate-brown, slightly darkened on top of head; hands and feet touched with yellowish white; terminal third of tail black.**Underparts.**—Whitish with yellowish suffusion; underside of tail same as upperside.

Winter pelage everywhere white except for the black tip on tail; a yellowish tinge on lower back and underparts.

Immature pelage very much like that of adults.

Measurements.—Total length, males, 11 inches, females, 9 inches; tail vertebræ, males, 3.2 inches, females, 2.8 inches; hind foot, males, 1.45 inches, females, 1.22 inches.

Geographical Distribution.—Practically all of North America.

Food.—Small mammals and birds.

Enemies.—Doubtless caught, on occasion, by Great Horned Owls, and probably by other predatory mammals such as Fox, Lynx, Mink, Fisher, etc., but so active as to escape most four-footed enemies, except under very exceptional circumstances.

Species and Subspecies of the Genus *Mustela*

Subgenus *Mustela*

All the following forms, except *rixosa* and its subspecies, have black-tipped tails, in summer and winter.

Bonaparte Weasel.—*Mustela cicognani cicognani* Bonaparte.

As described above. Found in "Boreal forest-covered parts of North America from New England and Labrador to coast of southeastern Alaska (Juneau, Wrangel, and Loring), and south in the Rocky Mountains to Colorado (Silverton). It occurs in the interior of British Columbia (at Sicamous), but in the Puget Sound region is replaced by a smaller and darker form, *P. streatori*. In the United States it is common in New England and New York, and in the forest-covered parts of Minnesota. It probably occurs also in northern Michigan and Wisconsin." (Merriam)

Richardson Weasel.—*Mustela cicognani richardsoni* (Bonaparte).

Like typical *cicognani* but larger and with longer tail. Total length, males, 15.6 inches; tail vertebræ, 3.8 inches; hind foot, 1.8 inches. Found in "Hudsonian timber belt from Hudson Bay to interior of Alaska and British Columbia." (Merriam)

Newfoundland Weasel.—*Mustela cicognani mortigena* Bangs.

Similar to *richardsoni* but less brown in summer, tail shorter, and less white on hands and feet. Upperparts Prout's brown in summer. Total length, males, 13 inches, females, 11 inches; tail vertebræ, males, 3.8 inches, females, 3.2 inches; hind foot, males, 1.9 inches, females, 1.4 inches. Found in Newfoundland.

Juneau Weasel.—*Mustela cicognani alascensis* (Merriam).

Resembling *richardsoni* but with more white on feet. Total length, males, 13.5 inches, females, 11 inches; tail vertebræ, males, 3.8 inches, females, 3.1 inches; hind foot, males, 1.9 inches, females, 1.4 inches. Found in the region about Juneau, Alaska.

Small-eared Weasel.—*Mustela microtis* (Allen).

Somewhat resembling *richardsoni* in color, but smaller; ears very small. Upperparts dark brown with slight golden tinge; underparts white washed with sulphur-yellow. Males, total length, 11.8 inches; tail vertebræ, 3.3 inches; hind foot, 1.5 inches; ear from crown, .76 inch. Found in the vicinity of Shesley, British Columbia.

Puget Sound Weasel.—*Mustela streatori streatori* (Merriam).

Smaller and darker than typical *cicognani*, with dark brown of upperparts reaching well onto belly, sometimes meeting along mid-line; terminal third of tail black. Winter pelage may or may not be white, depending upon locality. Total length, males, 11 inches, females, 8.5 inches; tail vertebræ, males, 3.3 inches, females, 2 inches; hind foot, males, 1.3 inches, females, 1.0 inch. Found in "Puget Sound and coast region of Washington and Oregon; south at least to Yaquina Bay (Newport), Oregon. Confined to a narrow strip along the coast." (Merriam)

Dwarf Weasel.—*Mustela streatori leptus* (Merriam).

Very small in size, less black on tail than in typical *streatori*. Upperparts, summer, dark brown, tip of tail black; underparts white. In winter white without yellowish tinge, tip of tail black. Total length, males, 9.8 inches; tail vertebræ, 2.6 inches; hind foot, 1.3 inches. Found in Rocky Mountains from Colorado into Alberta.

Little Weasel; Sierra Least Weasel.—*Mustela muricus* (Bangs).

Size very small; tail short, black-tipped. Upperparts drab brown with tendency toward olivaceous; underparts white. Total length, males, 8.8 inches; tail vertebræ, 2.4 inches; hind foot, 1.24 inches. Known from El Dorado County, California.

Least Weasel; Bangs Weasel.—*Mustela rixosa rixosa* (Bangs).

Size very small, smallest of the Weasels; tail short and having no black tip; upperparts uniform dark reddish brown; underparts white. Winter pelage white, including tip of tail. Total length, females, 6 inches; tail vertebræ, 1.2 inches; hind foot, .9 inch. Found in "Boreal America from Hudson Bay to coast of Alaska (St. Michaels); south to northern Minnesota (Pembina) and Montana (Sun River)." (Merriam) Plate VIII.

Alaskan Least Weasel.—*Mustela rixosa eskimo* (Stone).

Similar to typical *rixosa*, but duller in color. Upperparts (summer) brown with slight reddish tinge. Total length, males, 11.2 inches, females, 7.4 inches; tail vertebræ, males, 1.2 inches, females, 1.0 inch; hind foot, males, .84 inch, females, .76 inch. Found in the region about Point Barrow, Alaska.

Alleghenian Least Weasel.—*Mustela allegheniensis* (Rhoads).

Resembling *rixosa* but larger and darker. Upperparts (summer) walnut-brown, underparts pure white; tail lacking black tip or with only a few black hairs. Winter pelage

everywhere white. Total length, females, 7 inches; tail vertebræ, .8 inch; hind foot, .8 inch. Found in Pennsylvania in Allegheny mountains.

Plains Least Weasel.—*Mustela campestris* Jackson.

Like *rixosa* in color but paler and with more white on underparts. Upperparts (summer) Prout's brown, tail without black tip; underparts white, extending onto forefeet. Total length, males, 7.4 inches; tail vertebræ, 1.3 inches; hind foot, .76 inch. Taken at Beemer, Cuming County, Nebraska.

Tundra or Arctic Weasel.—*Mustela arctica arctica* (Merriam).

"Size large; ears small; tail short but with very long black pencil; underparts yellow (including underside of basal half of tail)." Summer pelage dark yellowish brown above; in winter, white all over except for black tip of tail and yellowish suffusion posteriorly. Total length, males, 16 inches; tail vertebræ, 3 inches; hind foot, 2.0 inches. Found on "Arctic coast and tundras. Specimens examined from Anderson River, Franklin Bay, old Fort Good Hope, lower Mackenzie River, Point Barrow, and St. Michaels." (Merriam) Plate VIII.

Polar Weasel.—*Mustela arctica polaris* (Barrett-Hamilton).

Resembling typical *arctica*. Upperparts (summer) golden brown; underparts deep "primrose yellow," white on upper lip, chin, and upper throat. Found in Hall Land, northern Greenland.

Greenland Weasel.—*Mustela audax* (Barrett-Hamilton).

Medium in size; tail short, with definite black pencil. Upperparts (summer) wood-brown; underparts white, a clear line of demarcation between upper and lower parts. Found in North Greenland.

Kodiak Island Weasel.—*Mustela kadiacensis* (Merriam).

Resembling *arctica* but smaller and differing in cranial characters. Total length, males, 12.8 inches; tail vertebræ, 3.4 inches; hind foot, 1.8 inches. Found only on Kodiak Island, Alaska.

Queen Charlotte Weasel.—*Mustela haidarum* (Preble).

Resembling *kadiacensis* but smaller and with more black on the tail. Upperparts (summer) very dark brown. In winter white, with saffron tinge posteriorly and on underparts. Tail black for about sixty per cent of its length. Males, total length, 11 inches; tail vertebræ, 2.4 inches; hind foot, 1.5 inches. Found on Graham Island, Queen Charlotte Islands, British Columbia.

New York Weasel.—*Mustela noveboracensis noveboracensis* (Emmons). Plate VIII.

Males large, females much smaller; tail long and bushy, with black tip for third to half its length. Upperparts dark, rich brown; underparts white, with more or less yellowish wash. Winter pelage white except in southern part of its range. Total length, males, 16.3 inches, females, 13 inches;

tail vertebræ, males, 5.8 inches, females, 4.3 inches; hind foot, males, 1.9 inches, females, 1.4 inches. Found in "Eastern United States from southern Maine to North Carolina, and west to Illinois." (Merriam)

Southern Weasel.—*Mustela noveboracensis notia* (Bangs).

Resembling typical *noveboracensis* but darker brown above and yellow below instead of white. Upperparts (summer) dark chocolate-brown to seal-brown. Males, total length, 17 inches; tail vertebræ, 6.8 inches; hind foot, 1.9 inches. Found from North Carolina to District of Columbia.

Northern Long-tailed Weasel.—*Mustela occisor* (Bangs).

Very large and long-tailed. Tail not as broad as in *noveboracensis* and black tip very restricted. Color pattern much as in *noveboracensis*. Total length, males, 18 inches, females, 13.5 inches; tail vertebræ, males, 7 inches, females, 4.5 inches; hind foot, males, 2.1 inches, females, 1.6 inches. Taken at Bucksport, Maine.

Washington Weasel.—*Mustela washingtoni* (Merriam).

"Similar to *P. noveboracensis* in size and general appearance, but with longer tail and shorter black tip. Female very much smaller than male, as in *noveboracensis*." (Merriam) Total length, males, 16 inches, females, 14.4 inches; tail vertebræ, males, 6 inches, females, 4.8 inches; hind foot, males, 1.8 inches, females, 1.5 inches. Found in the vicinity of Mount Adams, Washington.

Florida Weasel.—*Mustela peninsulæ peninsulæ* (Rhoads).

Quite similar to *noveboracensis* externally but differing in cranial characters. Upperparts chocolate-brown; underparts yellowish; white on upper lip and chin; brown spot behind corners of mouth. Total length, females, 15 inches; tail vertebræ, 5 inches; hind foot, 1.8 inches. Found in the "Peninsula of Florida; limits of range unknown." (Merriam)

Alabama Weasel.—*Mustela peninsulæ olivacea* Howell.

Resembling typical *peninsulæ*, but color in winter paler and more olivaceous and with less yellow on feet. Upperparts (winter) buffy brown; underparts straw-colored; black tip of tail about 3 inches. Total length, males, 16.8 inches; tail vertebræ, 5.6 inches; hind foot, 2 inches. Found in Central Alabama.

Long-tailed Weasel.—*Mustela longicauda longicauda* Bonaparte.

Size large; tail long, with relatively short black tip; underparts strongly yellowish. Upperparts pale yellowish brown, darker on head; white on upper lip and chin; underparts deep buffy yellow to warm ochraceous. White in winter. Total length, males, 18 inches, females, 15.5 inches; tail vertebræ, males, 6.6 inches, females, 5.8 inches; hind foot, males, 2 inches, females, 1.8 inches. Found on "Great Plains from Kansas northward." (Merriam)

Mountain Long-tailed Weasel.—*Mustela longicauda oribasus* (Bangs).

Darker than typical *longicauda* but equal to it in size. Upperparts dark brown, without any tinge of reddish, darker about head; underparts buffy yellow; white on upper lip and chin and on tops of feet. Total length, females, 15.6 inches; tail vertebræ, 6 inches; hind foot, 1.8 inches. Found in the region about the head of Kettle River, British Columbia.

Minnesota Weasel.—*Mustela longicauda spadix* (Bangs).

Resembling typical *longicauda* but darker, upperparts chocolate-brown. Total length, males, 18.2 inches, females, 14 inches; tail vertebræ, males, 6.6 inches, females, 5.3 inches; hind foot, males, 2.2 inches, females, 1.7 inches. Found in "Edge of timber belt in Minnesota, along boundary between Transition and Boreal Zones." (Merriam)

Missouri Weasel.—*Mustela primulina* Jackson.

A bright-colored member of the *longicauda* group. Darker above than *longicauda*, underparts yellow, not buff. Upperparts Brussels brown; tail black-tipped; chin white. Total length, females, 13 inches; tail vertebræ, 5 inches; hind foot, 1.8 inches. Taken at Avilla, Jasper County, Missouri.

Cascade Mountain Weasel.—*Mustela saturata* (Merriam).

Large, long-tailed, dark. Upperparts dark, raw umber-brown, darker on top of head; brown spot at corner of mouth; chin white; underparts yellow to orange. Total length, males, 17 inches; tail vertebræ, 6.6 inches; hind foot, 1.9 inches. Found in "Cascade and Siskiyou Mountains of Oregon and Washington, northward into British Columbia." (Miller)

Mountain Weasel.—*Mustela arizonensis* (Mearns).

Resembling *longicauda* in color and markings, but smaller. Upperparts raw umber-brown, darker on head; underparts yellow to orange, except for white chin and upper lip. Total length, males, 15.4 inches, females, 14 inches; tail vertebræ, males, 5.8 inches, females, 5.2 inches; hind foot, males, 1.8 inches, females, 1.6 inches. Found in "Broadly, the Sierra Nevada and Rocky Mountain systems, reaching British Columbia in the Rocky Mountain region, but not known north of the Siskiyou Mountains in the Sierra-Cascade system." (Merriam)

Black Hills Weasel.—*Mustela alleni* (Merriam).

Resembling *arizonensis* but more yellow on upperparts, which are golden to yellowish brown. Total length, males, 15 inches; tail vertebræ, 5.5 inches; hind foot, 1.8 inches. Found in the "Black Hills, South Dakota." (Merriam)

California Weasel.—*Mustela xanthogenys xanthogenys* Gray.

"Size medium; tail long; face conspicuously marked with whitish, but rest of head not black; underparts ochraceous. Upperparts from back of head to terminal part of tail in *summer pelage* raw umber-brown, tinged with golden; in *winter pelage*, drab brown, without yellowish suffusion; head always darker, becoming dusky over nose; a large

rectangular spot between eyes, and a broad oblique band between eye and ear, whitish; end of tail black; a brown spot behind corners of mouth; chin white; rest of underparts, including forefeet all round and inner side and toes of hind feet, varying from buffy ochraceous to ochraceous orange." (Merriam) Total length, males, 16 inches, females, 14.7 inches; tail vertebræ, males, 6.2 inches, females, 5.4 inches; hind foot, males, 1.7 inches, females, 1.6 inches. Found in "Sonoran and Transition faunas of California, on both sides of the Sierra Nevada." (Merriam)

Redwoods Weasel.—*Mustela xanthogenys munda* (Bangs).

Resembling typical *xanthogenys* but smaller and darker. Upperparts (winter) dark, rich tawny russet, dusky on top of head and nose; underparts deep rich orange-buff. In summer darker and duller above, paler below. Males, total length, 15 inches; tail vertebræ, 5.6 inches; hind foot, 1.7 inches. Found in the coast region of northern California.

Oregon Weasel.—*Mustela xanthogenys oregonensis* (Merriam).

Larger, darker, and with more restricted face markings than typical *xanthogenys*. Upperparts pale chocolate-brown; tail without any yellowish tinge, terminal fifth black. Total length, females, 16.5 inches; tail vertebræ, 6.2 inches; hind foot, 1.8 inches. Found in "Rogue River Valley, Oregon; limits of range unknown." (Merriam)

Bridled Weasel.—*Mustela frenata frenata* Lichtenstein.

A large, long-tailed Weasel with conspicuous white markings on head. Upperparts light brown except for top of head, which is blackish, marked by a white band between eye and ear and a small white spot between eyes; underparts ochraceous yellow, whitish on chin and throat, dark spot behind corner of mouth; tail with short black tip. Total length, males, 19.5 inches, females, 17.5 inches; tail vertebræ, males, 7.7 inches, females, 7.5 inches; hind foot, males, 2 inches, females, 1.7 inches. Found from the Valley of Mexico north to southern Texas. Plate VIII.

New Mexico Bridled Weasel.—*Mustela frenata neomexicana* (Barber and Cockerell).

Paler than typical *frenata*, with more white on head. Upperparts pale yellowish ochre; terminal two inches of tail black; underparts similar to back but paler; head brownish black with large whitish patch between eyes, and with broad whitish band between eye and ear. Males, total length, 20 inches; tail vertebræ, 8 inches; hind foot, 2 inches. Found in the Mesilla Valley of New Mexico

Subgenus *Putorius*

Black-footed Ferret.—*Mustela nigripes* (Audubon and Bachman). Plate VIII.

Size large; more robust than other North American Weasels, mink-like. Upperparts pale buffy yellow, with a sprinkling

of dark brown hairs on crown and back; underparts buffy or cream-colored; hands and feet blackish; a broad black band across eyes like a mask; tail short, colored like body, except for short blackish tip. Total length, males, 23 inches; tail vertebræ, 5.3 inches; hind foot, 2.4 inches. Female slightly smaller. Found on "Great Plains, from western North Dakota and northern Montana to Texas; not known west of eastern base of Rocky Mountains." (Miller.)

* * * * * * *

Weasels are widely distributed over both the Eastern and Western Hemispheres, but the group is essentially a northern one and the greatest number of species is found north of the equator. Throughout North America north of the Rio Grande there are no fewer than 36 species and subspecies of this active little carnivore, and it would appear as if nature had evolved a special type of Weasel to fit each economic niche.

There are small Weasels, such as *rixosa*, which feed on Meadow Mice and very small rodents, the larger Weasels, such as *arctica* which prey on Hares, and Weasels such as *noveboracensis* and *arizonensis* which hunt a variety of game and are equipped to gain a living from a great many different sources. The largest of our Weasels, the Black-footed Ferret, preys upon Prairie-dogs.

Weasels are highly carnivorous and predatory, representing an extreme development along these lines. They are intensely active and alert, about at all seasons of the year and may be seen at any hour of the day. They are probably most active at night, however, and rest much of the day. In the regions where winters are cold and long the Weasels turn white, but in the southern parts of their range they maintain the yellow or brown summer pelage throughout the year, only slightly different in winter, due to wear and molt. In the winter coat, any of the Weasels may be called Ermine, but *arctica* is most nearly related to the true Ermine of the Old World.

Weasels are essentially terrestrial, although they have been known to climb trees, and seem to be sure of themselves above the ground; they habitually hunt on the ground or in the burrows under the ground. Possessed of good powers of smell, sight, and hearing, they are tireless hunters and are so remarkably successful that one wonders how small mammals and ground-nesting birds are able to maintain themselves

against such enemies. The Weasel kills not only for food, but seemingly for sheer pleasure, and when in the midst of a number of victims slays all. As many as forty chickens have been killed in one night by a single Weasel (fide Bachman) and Kennicott tells of finding a pile of a hundred or more Rats and Mice killed by Weasels. The normal food of Weasels is warm blood which is sucked from the neck or base of the skull of the victim.

Weasels are curious and bold. When one is discovered it is a simple matter to attract its attention, and even after it has disappeared in a rock-pile a squeak will cause it to reappear almost instantly. This small hunter is so fearless and confident of its powers that it will not hesitate to attack mammals many times its own size, and so rapid are its movements it can dodge anything less rapid than a bullet. Indeed, it is credited with being able to dodge at the flash of a gun and escape even a bullet, but all that I ever shot at either did not possess such speed or else had very bad luck.

Weasels are easily trapped and enter a trap without suspicion. Since they prefer to kill their own game, it is probably curiosity more than hunger that takes them into the trap in places where wild life is at all abundant. Even in summer, when there was plenty for a Weasel to catch, I have caught them on baits far from fresh. A trapped Weasel is the very picture of baffled frenzy and rage, a furious creature that ounce for ounce would know no master.

The female Weasel has from four to six or even eight young at a birth and the mother is absolutely fearless in protecting her litter.

Subgenus *Lutreola*¹.

Dentition: Incisors, $\frac{3}{5}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{5}$; Molars, $\frac{1}{2}$ = 34.

Mink.—*Mustela vison*

and related forms

Names.—Mink; American Mink. Plate IX.

General Description.—A weasel-like mammal nearly as large as a small House-cat but much more slender. Body

¹ For a synopsis of this subgenus see N. Hollister, *Proceedings U. S. National Museum*, Vol. 44, pp. 471-480, 1913.

elongate and supple; head subtriangular viewed from above; ears small; neck long; legs short; tail about half as long as head and body, moderately bushy; feet with five toes; pelage composed of soft underfur more or less concealed by long,



FIG. 25. Mink

glistening guard-hairs; color dark, glossy brown; anal musk-gland well developed; semi-aquatic in habit; alert and active in behavior.

Color.—Sexes colored alike; no noticeable seasonal variation.

Upperparts a uniform dark umber-brown, rich and glossy in appearance, slightly darker along back and tail; underparts like upperparts except for white area on chin and irregular white spots which may be scattered anywhere.

Immature pelage not quite as dark as adults, and lacking most of the long, hard, outer hairs.

Measurements.—Females noticeably smaller than males. Total length, males, 24 inches; tail vertebræ, 8 inches; hind foot, 2.5 inches. Weight (large male) 2 pounds; females, 1 pound, 10 ounces.

Geographical Distribution.—Nearly all of North America, from Gulf of Mexico north to Arctic Circle.

Food.—Strictly carnivorous; fish, frogs, snakes, crayfish, small mammals, such as Muskrat, Mice, and Rabbits, and birds.

Enemies.—Few in number; Great Horned Owl.

Species and Subspecies of the Subgenus *Lutreola*

Eastern Mink or Little Black Mink.—*Mustela vison vison* Schreber.

As described above, the smallest of the American Minks. Found in "Eastern Canada, west to Hudson Bay; south in interior to Catskill Mountains, New York, and to northern Pennsylvania. Not found on the coast south of New Brunswick." (Hollister)

Common Mink.—*Mustela vison mink* (Peale and Beauvois).

Colored about as in typical *vison* or slightly darker; larger and more robust. Total length, males, 25.5 inches; tail vertebræ, 8.5 inches; hind foot, 2.9 inches. Found in "Eastern United States, from coast of New England south to North Carolina, and, in the interior, to central Georgia and Alabama; westward through southern Pennsylvania and Ohio to Missouri and northeastern Texas." (Hollister)

Florida Mink.—*Mustela vison lutensis* (Bangs).

"Size medium; colors pale, russet to clay or reddish brown; tail short." Total length, males, 23 inches; tail vertebræ, 8 inches; hind foot, 2.8 inches. Found in region along "Coast of southeastern United States from South Carolina to Florida." (Hollister)

Southern Mink.—*Mustela vison vulgivaga* (Bangs).

Resembling *mink* but paler and smaller. Color uniform light brown, rich and lustrous, darker on end of tail; white on chin and small spot on throat. Total length, males, 24.5 inches; tail vertebræ, 7.5 inches; hind foot, 2.9 inches. Found on "Coast of Louisiana and Mississippi. North in the Mississippi River bottoms to northern Louisiana." (Hollister)

Mississippi Valley Mink.—*Mustela vison letifera* Hollister.

Color light brown, with white spots on chin, throat, and breast. Total length, males, 26 inches; tail vertebræ, 9.4 inches; hind foot, 2.9 inches. Found "From northern Wisconsin and northern South Dakota south to northern Illinois, northern Missouri, and southern Kansas." (Hollister)

Hudson Bay Mink.—*Mustela vison lacustris* (Preble).

Color dark chocolate-brown above, a little lighter below; white on chin and irregularly distributed on breast and between hind legs. Total length, males, 27 inches; tail vertebræ, 8 inches; hind foot, 3 inches. Found in "Interior of Canada from Great Bear Lake and western shores of Hudson Bay south through Alberta, Saskatchewan, and Manitoba, to southern North Dakota." (Hollister)

Western Mink or Pacific Mink.—*Mustela vison energumenos* (Bangs).

Small in size, dark in color. Color dark sooty brown, blackish on tail; chin white. Total length, males, 24 inches; tail vertebræ, 8.2 inches; hind foot, 2.9 inches. Found in "Western North America, from northern British Columbia

south to the Sierra Nevada Mountains in California and Rocky Mountains in New Mexico." (Hollister)

California Lowland Mink.—*Mustela vison aestuarina* Grinnell.

Resembling *energumenos* but smaller; separated from *energumenos* chiefly on the basis of cranial characters; color paler and pelage not so heavy. Found in "The lowlands of west-central California, particularly the delta region at the confluence of the Sacramento and San Joaquin rivers; west to Petaluma and Marin Counties. No minks are known to occur on the south side of Golden Gate and San Francisco Bay." (Grinnell)

Island Mink.—*Mustela vison nesolestes* (Heller).

"Size intermediate between *ingens* and *energumenos*; colors rather dark." (Hollister) Color Vandyke brown, lighter on cheeks and sides, darker on tail; underparts walnut-brown; white on chin, and irregular white spots or areas on throat, chest, inner arm, and abdomen. Total length, males, 24.5 inches; tail vertebræ, 7.3 inches; hind foot, 3.2 inches. Found in "Alexander Archipelago, Alaska." (Hollister)

Kenai Mink.—*Mustela vison melampeplus* (Elliot).

Darker than *energumenos*. Color dark chocolate without any reddish tinge; underparts slightly paler than upperparts; white spot on chin and sometimes throat. Total length, males, 28 inches; tail vertebræ, 7.2 inches; hind foot, 3 inches. Found in "Kenai Peninsula and Cook Inlet region, Alaska." (Hollister)

Alaska Mink; Big Mink.—*Mustela vison ingens* (Osgood).

Largest of existing American Minks; resembling *energumenos* but lighter in color. Total length, males, 28.8 inches; tail vertebræ, 7.2 inches; hind foot, 3.0 inches. Found in "Northern, western, and central Alaska; northern Yukon and northwestern Mackenzie; south to the Alaska Peninsula and to Fort Good Hope, Mackenzie; east to Anderson River." (Hollister)

* * * * *

The Mink is merely a large Weasel of somewhat specialized habits and shows this relationship rather clearly in its general structure. It differs from the other Weasels in slightly more robust build, uniformly darker coloration, and semiaquatic habits.

This mammal has a wide range, but prefers the vicinity of streams or standing water. It is found in the forests or out on the plains where it follows the water-courses. The den may be in a burrow in a bank, under logs, in rocks, or in any similar nook.

Much of the food of the Mink is caught in the water, but this animal is not so specialized for an aquatic existence as the

Otter and does much hunting along the banks of streams. It is fully capable of catching active fish such as trout, and thus its range of diet runs all the way from mammals such as Rabbits and Muskrats, through frogs and less active land dwelling prey, to any of the highly developed forms of stream life. There are records to tell of the bloodthirsty temperament of the Mink and apparently it sometimes kills for the sheer love of the act, although it is said to be less given to this than the smaller Weasels. It has also been stated that the Mink can be tamed and makes a very interesting pet. A trapped Mink is the triple distilled essence of fury and red-eyed rage.

The odor of the musk carried by the Mink, as by all the Weasels, and set free at moments of great excitement, is very powerful and disagreeable, more offensive to the nostrils of some people than the musk of the Skunk.

Although the Mink can and does climb, upon occasion, it seldom does so.

The fur of the Mink is of high quality, being durable, of close texture, and a good natural color.

The Mink has five or six young in the average litter, the number varying from three to ten. They are born from April to May and there is but one brood a season.

Subfamily *Guloninae*. Wolverines

Form heavy and robust; size large; feet subplantigrade; tail short and bushy, the hairs drooping; pelage quite long; anal scent-glands moderately developed; habit terrestrial.

Genus *Gulo*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{2}$ = 38.

Wolverine—*Gulo luscus*

and related forms

Names.—Wolverine; Glutton; Carcajou; Skunk-bear.

General Description.—A sturdy, long-haired member of the Weasel family of which it is the largest. Head broad and powerful; ears short; form robust and bear-like; legs sturdy; toes five on fore- and hind feet; claws large and curved, semi-retractile; soles hairy; semiplantigrade; tail fairly long, heavy,

and bushy; pelage long and thick; color pattern dark brown with broad, light, lateral band.

Color.—Sexes colored alike; no very marked seasonal variation in color but great individual variation shown.

Upperparts.—Dark brown to almost black, marked with two broad, pale, lateral bands, brownish white to yellowish



FIG. 26. Wolverine

white, which run from just back of shoulder to rump where they merge and extend onto basal half of tail above; head grizzled gray and brown; muzzle dark.

Underparts.—Dark brown with an irregular spot or two of yellowish white on throat or chest.

Immature resemble adults in appearance.

Measurements.—Males slightly larger than females. Total length, males, 41 inches, females, 37 inches; tail vertebrae, males, 8.5 inches, females, 7.2 inches; hind foot, males, 8 inches, females, 7 inches; weight, males, 30-35 pounds, females, 22-27 pounds.

Geographical Distribution.—North America from the Arctic Ocean south into the northern United States.

Food.—Birds, mammals, amphibians, fish, and berries, but principally rodents such as Ground Squirrels, Woodchucks, Mice, Beaver, etc.; occasionally even Caribou and Moose.

Enemies.—Apparently not attacked by any of the larger carnivores.

Species of the Genus *Gulo***Common Wolverine.**—*Gulo luscus* (Linnæus). Plate XI

As described above. Found from the Arctic Ocean and Baffin Bay southward and from the Pacific to the Atlantic, reaching the extreme northeastern United States, Wisconsin, Michigan, Minnesota, North Dakota, and down the Rocky Mountains into Utah and Colorado.

Mount McKinley Wolverine.—*Gulo hylæus* Elliot.

Coloration very dark. "Head, throat, sides of neck and body, and base of tail chestnut; hind part of neck, back, underparts, legs, and feet black; chest spotted or blotched with white or orange, and orange spot on anal region; nose darker chestnut than head; tail, except at base, black." (Elliot) Found in the region of Mount McKinley, Alaska.

Southern Wolverine.—*Gulo luteus* Elliot.

Rather paler in color than *luscus* but like it in color pattern. Top of head and back of eyes pale gray; buff on sides, and upper base of tail; black on nose, legs, feet, and most of tail; chestnut on nape, lower back, and rump. Total length, 38 inches; tail vertebræ, 8 inches; hind foot, 6.8 inches. Found in the Sierra Nevada Mountains of California from Tulare County north; limits of range unknown but reported from Yakutat Bay, Alaska.

Gulo auduboni Matschie. Taken in Newfoundland.

Gulo bairdi Matschie. Taken at Fort Union, North Dakota.

Gulo katschemakensis Matschie. Taken on the Kenai Peninsula, Alaska.

Gulo niediecki Matschie. Taken at Dease Lake, British Columbia.

The above four species are listed in Miller's *North American Recent Mammals*. They all appear to be synonyms of *Gulo luscus* since they are indistinguishable from that animal.

* * * * *

The status of the Wolverines is not very satisfactory and the genus calls for a revision. It is likely that all of the North American Wolverines should be subspecies of one full species, *luscus*.

The Wolverine has an unenviable reputation most of which it has truly earned, but part of which has been imparted to it by fanciful legend. Since it is not a common animal today in regions which most of us may visit, we must turn to the accounts of the trappers, traders, and explorers who know the north country, or to the descriptions of the naturalists who knew it before it disappeared from its early range.

The size and powerful body of the Wolverine set it off from the other carnivores for it is the largest of the Weasel family,

much larger than the so-called small carnivores but smaller than a Black Bear. The long, dark pelage, marked with the broad lateral bands of yellowish white, is an unmistakable character of identification.

This big cousin of the Weasel confines its activities to the ground; he can climb low trees if need be. Accounts of the Wolverine credit it with unusual strength and an aggressive disposition before which even the Bear gives way. Upon rare occasion it will attack and kill Deer and Caribou, and has been known to attack even the Moose. It digs out or breaks into the trapper's cache and carries off or scatters and ruins all his stores. It follows the trail of the trapper when he makes his rounds and destroys every animal it finds in the traps or breaks the traps themselves.

The number of young in a Wolverine family is generally two or three but may reach five. They are born in June to July (in high latitudes). The female makes a nest of leaves under rocks or in some sheltered cranny.

The name Glutton has been given to the Wolverine because of the supposed greediness of the animal. There is little to show that it is any more greedy than other carnivores, which are all heavy eaters when food is plentiful.

Subfamily *Lutrinæ*. Otters

Form long and slender; head flattened; legs very short; toes webbed; claws reduced or absent; tail long and muscular; pelage very dense; habit semiaquatic.

Genus *Lutra*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{2}$ = 36.

Otter.—*Lutra canadensis*

and related forms

Names.—Otter: Common Otter; Land Otter; River Otter.

General Description.—A long, lithe-bodied carnivore, of weasel-like form, with webbed feet, and long tail. Size large; head rather broad and flat; body long and proportionally slender; legs short; fore- and hind feet with five toes, soles hairy, forefeet webbed; tail long and tapering, pelage very

dense and composed of thick, short underfur and long, glistening guard-hairs; habit more or less aquatic. Plate IX

Color.—Sexes colored alike; no very marked seasonal variation in color.

Upperparts uniform glossy brown, dark and rich in tone, grayish on lips and cheeks; underparts lighter than upperparts, with grayish tinge.



FIG. 27. Otter

Measurements.—Total length, 40-45 inches; tail vertebræ, 12.5-15 inches; hind foot, 4-4.7 inches. Weight from 18 to 25 pounds, about 20 being average.

Geographical Distribution.—Most of North America.

Food.—Principally fish and crayfish, but at times birds and small mammals such as ducks, poultry, Muskrats, young Beaver, etc.; frogs on occasion.

Enemies.—Except for man, well able to elude any animal powerful enough to be an enemy.

Species and Subspecies of the Genus *Lutra*

Canada Otter.—*Lutra canadensis canadensis* (Schreber).

As described above. Found from Labrador to north of the Arctic Circle in Alaska and Yukon, south on the Atlantic coast to South Carolina.

Interior Otter.—*Lutra canadensis interior* Swenk.

Paler and larger than typical *canadensis*. Upperparts (summer) dark reddish brown. Total length, 53 inches;

tail vertebræ, 18 inches; hind foot, 4.8 inches. Found in Nebraska and adjacent states; limits of range unknown.

Carolina Otter.—*Lutra canadensis lataxina* (F. Cuvier).

Small, lighter in color than typical *canadensis*, and soles of feet less hairy. Upperparts Prout's brown washed with pale yellowish on sides of head and neck. Total length, 45 inches; tail vertebræ, 18 inches. Found in the southeastern states—North and South Carolina—limits of range unknown.

Florida Otter.—*Lutra canadensis vaga* (Bangs).

Slightly larger than typical *canadensis*, with longer tail and more reddish in color. Upperparts, "Lustrous chestnut-brown, somewhat paler below; cheeks, lips, chin, throat, and sides of neck grizzled yellowish brown." (Bangs) Total length, 51 inches; tail vertebræ, 19.5 inches; hind foot, 5.2 inches. Found in Florida and eastern Georgia.



FIG. 28. Feet of Otter; hind foot at left, forefoot at right.

Pacific Otter.—*Lutra canadensis pacifica* (Rhoads).

Very large; browner than typical *canadensis*. Upperparts ruddy seal-brown; pale wood-brown on sides of head, neck, and on breast; underparts much lighter than upperparts. Total length, 45 inches; tail vertebræ, 17 inches; hind foot, 5 inches. Found in the Pacific Northwest from Oregon to the coast of Alaska.

California Otter.—*Lutra canadensis brevipilosus* Grinnell.

"Similar to *L. c. pacifica* and *L. c. periclyzomæ* but general size greater, pelage shorter, coloration paler, . . ." (Grinnell) Upperparts bister, grizzled with light-tipped hairs; paler on sides and underparts; much paler, buffy brown, on throat, chin, and upper lip. Total length, 46 inches; tail vertebræ, 18 inches; hind foot, 5 inches. Found in California on Sacramento and San Joaquin drainages.

Sonora Otter.—*Lutra canadensis sonora* (Rhoads).

Large in size, light in color. Upperparts brown, grizzled with light-tipped hairs giving impression of pale brown; underparts light grayish brown; pale yellowish or cream color on sides of head and neck. Total length, 52 inches; tail vertebræ, 19 inches; hind foot, 5.8 inches. Found in Arizona and southern California.

Queen Charlotte Otter; Island Otter.—*Lutra periclydomæ* Elliot.

Known only from skulls; no descriptions of external characters have been published. Probably as large or larger than *pacifica*. Found on the Queen Charlotte Islands, British Columbia.

Newfoundland Otter.—*Lutra degener* Bangs.

Size small; color dark. Upperparts seal-brown to blackish, lighter on sides of head and neck. Total length, 40 inches; tail vertebræ, 14 inches; hind foot, 4.6 inches. Found in Newfoundland.

* * * * *

The Weasel family is versatile and in the Otter it has a member which is the finest aquatic specialization, short of the Sea Otter, among the mammals which live on the land and have four limbs recognizable as legs. The Otter has made the most of its dry-land equipment and the broad, webbed feet give it such mastery of the streams that it catches the swiftest of fish, while the dense fur and subcutaneous layer of fat make it indifferent to long immersion.

The long, lithe body, large size, webbed feet, and long, muscular tail are sufficient identifying characters.

Otters are never far distant from lakes or water-courses although they are great travelers and are known to have an individual range of many miles. In summer their movements are governed by the abundance or scarcity of fish and under favorable circumstances food is easy to get, but in winter ice may close the streams and the Otter are forced to seek stretches where rapids or falls provide open water. Such places may be scarce and far apart.

The Otter is a playful mammal and one of the common manifestations of this playfulness is the "otter-slide" which is a steep slope down which the animals coast on the breast and belly, with the forelegs bent backward out of the way. These slides are oftenest noted on the snow in winter, but may also be made on slippery clay banks in summer. At the bottom of such a slide the Otter dives into the water. The stories told

of tame Otter indicate that they make unusual pets, friendly, good natured, and with very little of the uncertain temper common to the Weasels.

The Otter is a strong and capable fighter and more than a match for a Dog in fair fight on land; in the water the Otter is much more than a match for a Dog.

From one to three young are born to the Otter, with as many as five noted in an exceptional instance. The young arrive in late April and but one family is reared in a season. It is said to have its den in a bank with an under-water entrance, or less frequently in a hollow log.

The Otter is active at all hours. "The species makes a variety of noises. It utters a loud sniffing that sounds like clearing its nose of water, and it growls and snarls in menace. A female in the National Zoo at Washington, obtained in northern New York, often emitted a loud birdy chirp to express inquiry, desire, or hunger. Another female that I was sketching at the same time (April 28), made a low chatter or querulous grumble that seemed to express the same idea. The latter was from Florida. A captive Otter kept by J. K. MacDonald, of Winnipeg, in 1886, at Bersimis on the Gulf of St. Lawrence, used to utter such a piercing whistle that my informant repeatedly heard across the river (a mile and a half away), as plainly, he said, as he could hear a man whistle if in the same room with him. He knew of no other animal sound so shrill, save the scream of the eagle or loon." (Seton.)

The fur of the Otter is valuable and very serviceable, being among the most durable of all the furs.

Subfamily **Enhydrinæ**. Sea Otters

Characters as given under *Enhydra*.

Genus **Enhydra**

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{2}$ = 32.

Sea Otter.—*Enhydra lutris*

and subspecies

Names.—Sea Otter; Sea Beaver; Kalan.

General Description.—A large Otter with specialized structures for a marine habitat. Head rather broad and flat; ears

almost hidden in fur; body supple; limbs short; forefeet proportionally small; hind feet broadly webbed, flipper-like, haired on both surfaces; tail short and thick.

Color.—Sexes colored alike; no marked seasonal variation in color.

Upperparts dark brown or brownish black, glossy and rich in tone, sprinkled with white-tipped hairs; grayer on top of head and neck; underparts same as upperparts.

Measurements.—Total length, about 4 feet; tail vertebræ, 12 inches; hind foot, 6 inches long by 4 inches wide.

Geographical Distribution.—Formerly the north Pacific coast south to Lower California.

Food.—Marine animal life such as fish, crustaceans, shell fish, cuttle-fish, sea-urchins, etc.; said to eat seaweeds and kelp when forced to do so, and to eat meat when obtainable.

Enemies.—Killer Whale and Steller Sea Lion.

Species and Subspecies of the Genus *Enhydra*

Northern Sea Otter.—*Enhydra lutris lutris* (Linnæus).

As described above. Today exterminated over most of its range and to be found in North America only in a few scattered localities from Vancouver Island north to the Alaskan coast and adjacent islands.

Southern Sea Otter.—*Enhydra lutris nereis* (Merriam).

Larger than typical *lutris*, browner, less black, and with fewer white-tipped hairs. Total length, 4 to 6 feet; tail vertebræ, 11 inches; hind foot, 6 inches. Found today only in very few localities along coast of southern California south along lower California, or possibly even extinct.

* * * * *

The Sea Otter is such a rare mammal today, so nearly extinct, that there is very little likelihood any of the readers of this handbook will ever see one alive. There are only a few localities where Sea Otter are known to exist and these animals have become so wary that they very seldom come onto the land.

The favorite haunts are kelp beds and shallow waters along rocky islands and coves. They get all of their food from the sea and are expert swimmers, diving to depths of three hundred feet or more.

The young is usually but one to a birth, occasionally two, and may be born any month of the year. The mother is very affectionate and solicitous of her offspring.

Subfamily *Mephitinæ*. Skunks

Form robust; legs short; tail long and very bushy; feet subplantigrade; anal scent-glands highly developed; pelage quite long; color pattern conspicuous black and white; habit terrestrial.

Genus *Spilogale*¹

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{1}$ = 34.

Spotted Skunk.—*Spilogale putorius*

and related forms

Names.—Spotted Skunk; Little Spotted Skunk; Polecat; Little Striped Skunk. Plate X.

General Description.—A small Skunk, much less robust than *Mephitis* and more nearly weasel-like, about the size of a



FIG. 29. Spotted Skunk

half-grown House-cat. Pelage long; color pattern black and white, arranged in conspicuous stripes or connected spots; head small and weasel-like, legs short, tail bushy, both fore- and hind feet with four tubercles at the bases of the toes.

Color.—Sexes alike in color.

¹ For a full revision of this genus see A. H. Howell, *North American Fauna*, No. 26, 1906.

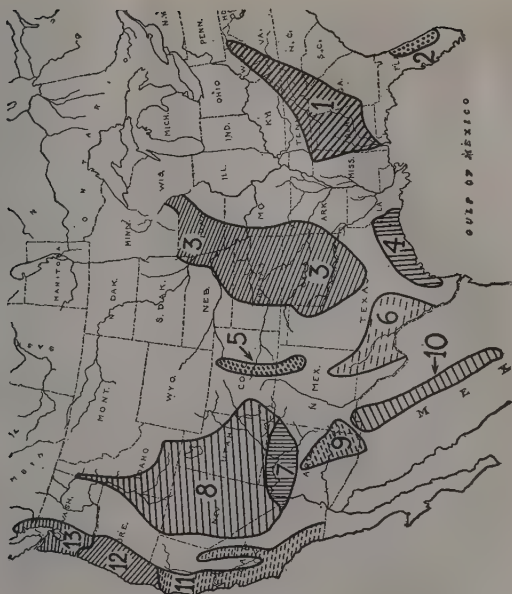


FIG. 30. Distribution of the species and subspecies of *Spilogale*, north of Mexico, after A. H. Howell

1. *Spilogale putorius*
2. *Spilogale ambarvalis*
3. *Spilogale interrupta*
4. *Spilogale indianola*
5. *Spilogale tenuis*
6. *Spilogale leucoparia*
7. *Spilogale gracilis gracilis*
8. *Spilogale gracilis saxatilis*
9. *Spilogale arizonae arizonæ*
10. *Spilogale ambigua*
11. *Spilogale phenax phenax*
12. *Spilogale phenax latifrons*
13. *Spilogale phenax olympica*

Upperparts.—Conspicuously contrasting pattern of alternate black and white areas: the ground or base color of body and tail is black, and white markings occur as follows; white spots or irregular areas on forehead between eyes, on each side of rump, and on each side of tail at base; four white stripes, parallel and running from crown or neck, along the upperparts about to middle of body; outer pair of white stripes reaches forward to in front of ear; a lateral white stripe reaching from behind foreleg to rump where it curves up onto back to meet or almost meet the dorsal stripe; on rump the white dorsal stripes continue as detached spots which are met by transverse white bands that pass in front of hips; tail black, except for white tip.

Underparts.—Black.

Immature marked like adults.

Measurements.—Males slightly larger than females. Total length, males, 19-22.5 inches; females, 17.5-21.8; tail vertebræ, males 7.8-8.8, females, 6.6-8.2 inches; hind foot, males, 1.8-2 inches, females, 1.5-1.8 inches.

Geographical Distribution.—Most of the United States.

Food.—Mainly insects, beetles, and grasshoppers but varied with small mammals, birds, eggs, lizards, salamanders, et cetera, and occasionally fruit.

Enemies.—Rather free from molestation by predatory creatures because of its musk defense, but sometimes caught and eaten by great Horned Owl and Bobcat.

Species and Subspecies of the Genus *Spilogale*

Alleghenian Spotted Skunk.—*Spilogale putorius* (Linnæus).

The animal of the above description. Found in "Mississippi, Alabama, western Georgia, western South Carolina, and northward along the Alleghenies to northern Virginia; western limits of range unknown." (Howell)

Florida Spotted Skunk.—*Spilogale ambarvalis* Bangs.

Smaller than *putorius*, with shorter tail and more white. Total length, males, 14-16 inches; tail vertebræ, 4.2-5.4 inches; hind foot, 1.5-1.7 inches. White dorsal stripes about as wide as the black areas they enclose; large, white spot on frontal area, white patch in front of ear which runs back into outer white dorsal stripe, white on terminal third of tail above, and on terminal half below; a strap-shaped white patch on tail near base, above. Found in "Eastern portion of peninsular Florida, from New Smyrna south to Lake Worth." (Howell)

Prairie Spotted Skunk.—*Spilogale interrupta* (Rafinesque).

Most like *putorius* but blacker and without prominent white tip to tail. Total length, males, 19.6-21.5 inches; tail vertebræ, 7.2-8.9 inches; hind foot, 1.8-2 inches. Dorsal stripes generally narrow and frequently interrupted and broken up into widely separated spots; white frontal spot small; white ear spot usually not running into white dorsal stripe; tail entirely black or at most with very small terminal tuft of white. Found in "Iowa, southern Minnesota, Nebraska, Kansas, Missouri, and Oklahoma; south in eastern Texas to about the middle of the state." (Howell)

Gulf Spotted Skunk.—*Spilogale indianola* Merriam.

Color pattern resembling the discontinuous striping of *interrupta*, but tail with white tip about equal to one-quarter of the upper surface; median pair of white stripes generally narrower than outer pair. Total length, males, 17.6-21 inches; tail vertebræ, 6.6-8.2 inches; hind foot, 1.8-2 inches; Found in "Coast region of Texas and Louisiana; south to Victoria, Tamaulipas." (Howell)

Rio Grande Spotted Skunk.—*Spilogale leucoparia* Merriam.

Characterized by extensive white markings. Lateral and outer pair of white dorsal stripes very broad; large white spots or areas on forehead, in front of ear, and on tail, terminal fourth above, terminal two-thirds below. Total length, males, 16 inches; tail vertebræ, 5.8 inches; hind foot, 1.9 inches. Found in "Arid region of western Texas and southern New Mexico; south over the eastern side of the Mexican table-land to Hidalgo; west to central Arizona." (Howell)

Rocky Mountain Spotted Skunk.—*Spilogale tenuis* Howell.

Resembling *leucoparia* but with narrower white lateral stripes; white patch on forehead long and narrow; end of tail white for terminal third. Total length, males, 18 inches; tail vertebræ, 6.6 inches; hind foot, 2 inches. Found on "Eastern slopes of the Rocky Mountains in Colorado and northern New Mexico; limits of range unknown." (Howell)

Canyon Spotted Skunk.—*Spilogale gracilis gracilis* Merriam.

Marked about as in *leucoparia* but with rather less white on tail; small size, slender. Total length, males, 13.4-16 inches; tail vertebræ, 5.2-6.4 inches; hind foot, 1.6-1.8 inches. Found in "Northern Arizona and desert ranges of southeastern California; south in the Sierra Madre to Jalisco and Michoacan." (Howell)

Great Basin Spotted Skunk.—*Spilogale gracilis saxatilis* (Merriam).

Somewhat larger than typical *gracilis* and generally without white lateral stripe, or else with it greatly reduced. Total length, males, 16.9-18 inches; tail vertebræ, 6.5-7 inches; hind foot, 1.8-2 inches. Found in "Utah, western Colorado, northern Nevada, southern Idaho, eastern Oregon, and northeastern California." (Howell)

Chihuahua Spotted Skunk.—*Spilogale ambigua* (Mearns).

Marked like *gracilis*, but with broad, white lateral stripes and white band on thighs. Total length, males, 16.5 inches; tail vertebræ, 5.9 inches; hind foot, 1.7 inches. Found "from central Arizona south over the western edge of the Mexican table-land to Jalisco." (Howell)

Arizona Spotted Skunk.—*Spilogale arizonæ arizonæ* (Mearns).

Marked much as in *gracilis* and *leucoparia*; broad, white, lateral stripe; tail white on terminal upper third and lower half. Total length, males, 17.8 inches; tail vertebræ, 6.4 inches; hind foot, 2 inches. Found in "Central and southern Arizona, southwestern New Mexico, and adjacent parts of Mexico." (Howell)

California Spotted Skunk.—*Spilogale phenax phenax* Merriam.

Resembling *putorius* in color pattern and size, but tail shorter; white dorsal stripes extending between ears; large white spots on forehead and in front of ear; white, curved patch on base of tail smaller than in *putorius*; white on tail for terminal upper fourth and lower half. Total length, males, 17-19.4 inches; tail vertebræ, 5.7-7.8 inches; hind foot, 1.9-2.1 inches. Found in "Greater portion of California, excepting extreme northern part and southeastern desert regions." (Howell)

Oregon Spotted Skunk.—*Spilogale phenax latifrons* Merriam.

Smaller than typical *phenax*, with more black; white dorsal stripes narrower, median pair usually very slender; lateral white stripe reduced or absent; white markings on flanks and rump reduced. Total length, males, 15.4-17.4 inches; tail vertebræ, 4.7-5.8 inches; hind foot, 1.8-2 inches. Found in "Coast region of Oregon and northern California." (Howell)

Puget Sound Spotted Skunk.—*Spilogale phenax olympica* (Elliot).

Marked as in *latifrons*, but with shorter tail, and longer, narrower white frontal spot. Total length, males, 16.5 inches; tail vertebræ, 4.5 inches; hind foot, 1.9 inches. Found in "The Olympic Peninsula and shores of Puget Sound; north (probably) to Howe Sound, British Columbia." (Howell)

* * * * *

The Spotted Skunk is not only the smallest of the North American Skunks, but it is the handsomest as well. The conspicuous color pattern of broken black and white differs noticeably from the pattern on the larger Skunks which is marked by black and white in broad bands or masses. In addition, the Spotted Skunks are more slender and graceful in build. They are like their larger relatives, however, in their ability to defend themselves.

The members of the genus *Spilogale* are found in various haunts, although they are essentially plains and desert animals. Some species occur in forests and on mountain slopes, and others show a preference for rocky canyons, cliffs, and broken country. The Spotted Skunks are more active than the big Skunks, and climb trees upon occasion.

The behavior of these small Skunks when attacked is about as described for the genus *Mephitis*, see page 131.

Spilogale has the reputation of giving hydrophobia when it bites man, and one of the names for the Spotted Skunk in the Southwest is "Hydrophobia Skunk" or "Phoby-cat." It is well known that both large and small Skunks may contract hydrophobia if bitten by a "mad" Coyote, for example, and there are authentic cases of deaths from bites given by "mad" *Spilogale*. However, this is of very rare occurrence and the average Skunk is scarcely more to be dreaded on this score than any other wild mammal. During an epidemic of hydrophobia in a given section the Skunks are perhaps more apt to be bitten because of the fact that they rely upon their defensive equipment which usually protects them, but would be valueless against a "mad" Coyote.

The Spotted Skunk is nocturnal in habit and does not roam about during the day. Observers credit this mammal with a playful and attractive disposition and find very little to mark up against him.

The young range from two to six in number, the average four or five. The maternal den is located in rocks, hollow logs, or may be in a burrow dug by the Skunk itself, or in a deserted burrow of Ground Squirrel, Wood Rat or Burrowing Owl.

Genus *Mephitis*¹

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{2}$ = 34

Large Striped Skunk.—*Mephitis mephitis*

and related forms

Names.—Large Striped Skunk; Big Skunk; Line-backed Skunk; Common Skunk. Plate X.

¹ For a revision of the genus *Mephitis* (under name of *Chincha*) see A. H. Howell, *North American Fauna*, No. 20, 1901.

General Description.—A heavy-bodied, black and white mammal, with large bushy tail, and well-developed scent-glands capable of forcibly discharging fluid of penetrating and disagreeable odor. Head proportionally small; body robust, about size of House-cat; legs short; tail large and bushy; feet



FIG. 31. Large Striped Skunk

semiplantigrade; claws of forefeet well developed for digging; pelage composed of long, hard hairs over a short, soft under-fur; color pattern conspicuous black and white; nocturnal and crepuscular in habit, but may sometimes be seen about in daytime; slow-moving and deliberate in behavior.

Color.—Sexes colored alike.

Upperpart glistening black, with broad white stripe or band from nape to shoulders, continuing to base of tail as a pair of lateral stripes enclosing a median black area; a narrow white stripe along nose to nape; tail black and white in varying proportions, all tail hairs white at base; underparts black.

Considerable variation from this pattern is shown by individuals; some races more variable than others.

Young striped like adults.

Measurements.—Males slightly larger than females. Total length, males, 24.5 inches, females, 23 inches; tail vertebrae, males, 7.5 inches, females, 6.6 inches; hind foot, males, 3.1

inches; females, 2.8 inches. Weight, large male, about eight pounds.

Geographical Distribution.—Practically all of United States and Canada north to 50° in east and 60° in west.

Food.—Insectivorous and carnivorous; insects, grasshoppers, crickets, larvæ, grubs, Meadow Mice, and any small mammals it can catch, eggs, frogs, snakes, crayfish, and occasionally poultry.

Enemies.—Very few because of protection given by scent-glands—Great Horned Owls are known to catch Skunks, and probably carnivorous mammals when pressed by starvation may kill an occasional Skunk.

Species and Subspecies of the Genus *Mephitis*

Subgenus *Mephitis*

Canada Skunk.—*Mephitis mephitis* (Schreber).

As described above; fairly constant in color pattern. Found in "Eastern Canada—Nova Scotia, Quebec, and northern Ontario; west and north at least to Oxford House, Keewatin." (Howell)

Northern Plains Skunk.—*Mephitis hudsonica* (Richardson).

Size large, tail bushy and heavy, tip broad and without white pencil; general color pattern as in *mephitis*. Total length, males, 29 inches, females, 24 inches; tail vertebræ, males, 10.5 inches, females, 10 inches; hind foot, males, 3.3 inches, females, 2.8 inches. Found in "Western Canada, from Manitoba to British Columbia (east of the Cascades); south in the United States to Colorado, Nebraska, and Minnesota." (Howell)

Mephitis minnesotæ Brass = *M. hudsonica*.

Eastern Skunk.—*Mephitis nigra* (Peale and Beauvois).

Tail longer than in *mephitis*, black, tipped with white; white dorsal stripes usually broader. Total length, males, 24 inches, females, 23 inches; tail vertebræ, males, 9 inches, females, 9 inches; hind foot, males, 2.5 inches, females, 2.4 inches. Found in "New England and Middle Atlantic States; south to Virginia; west to Indiana." (Howell)

Florida Skunk.—*Mephitis elongata* (Bangs).

"Size medium; tail very long, marked with white on the sides, and with a long white pencil; markings variable, but white stripes usually very broad." (Howell) Sexes about equal in size, total length, 28 inches; tail vertebræ, 12.6 inches; hind foot, 3 inches. Found in "Florida (from vicinity of Lake Worth) to North Carolina, and in the mountains to West Virginia; west on the Gulf coast to the Mississippi River." (Howell)

Louisiana Skunk.—*Mephitis mesomelas mesomelas* Lichtenstein.

Small in size, variable in color; tail short, usually entirely black; white stripes may or may not reach to tail. Not much difference in size between sexes. Total length, 23 inches; tail vertebræ, 9 inches; hind foot, 2.5 inches. Found on "West side of Mississippi Valley from southern Louisiana to Missouri; westward along the coast of Texas to Matagorda Island; and up the Red River Valley as far at least as Wichita Falls." (Howell)

Illinois Skunk.—*Mephitis mesomelas avia* (Bangs).

Resembling typical *mesomelas* and differing chiefly in skull characters. Total length, 25 inches; tail vertebræ, 8 inches; hind foot, 2.7 inches. Found in "Prairie region of Illinois, western Indiana, and eastern Iowa; boundaries of range imperfectly known." (Howell)

Long-tailed Texas Skunk.—*Mephitis mesomelas varians* (Gray).

Large and long-tailed; color pattern like that of *mephitis*; tail without white tip; fairly constant in marking. Total length, males, 30 inches, females, 27 inches; tail vertebræ, males, 15.7 inches, females, 15 inches; hind foot, males, 2.8 inches, females, 2.8 inches. Found in "Southern and western Texas, eastern New Mexico, and adjacent parts of Mexico; north into Oklahoma, Colorado, Kansas, and Nebraska." (Howell)

Arizona Skunk.—*Mephitis estor* Merriam.

Small in size, much white on body and tail; broad white dorsal stripes, in some specimens broad white area across lower back; white on upper surface of tail nearly concealing the black; white pencil at tip of tail. Total length, males, 25.6 inches; females, 23 inches; tail vertebræ, males, 11.4 inches, females, 11 inches; hind foot, males, 2.8 inches, females, 2.5 inches. Found in "Arizona, western New Mexico, Sonora, Chihuahua, and northern Lower California; south in the Sierra Madre to southern Chihuahua; limits of range unknown." (Howell)

California Skunk.—*Mephitis occidentalis occidentalis* Baird.

Large in size, tail long; markings fairly constant, pattern as in *hudsonica*; white stripes of medium width. Total length, males, 32 inches, females, 28 inches; tail vertebræ, males, 12.5 inches, females, 12 inches; hind foot, males, 3.1 inches, females, 3.0 inches. Found in "Northern and central California, from vicinity of Monterey Bay northward, west of the Sierra and Cascades, to the Willamette Valley, Oregon." (Howell)

Puget Sound Skunk.—*Mephitis occidentalis spissigrada* (Bangs).

Like typical *occidentalis* but with more white, and shorter tail; white stripes on back dividing about middle of back and white on tail very extensive. Total length, males, 26

inches, females, 25 inches; tail vertebræ, males, 10 inches, females, 9.4 inches; hind foot, males, 3.2 inches, females, 3.0 inches. Found on "Shores of Puget Sound and coast region of Washington and northern Oregon." (Howell)

Cascade Skunk.—*Mephitis occidentalis notata* (Howell).

Resembling typical *occidentalis* but white dorsal stripes narrower and separate for entire length, tail shorter; narrow white dorsal stripes sometimes interrupted and usually joined at nape, but not touching posterior to that region; tail black and with little or no white. Total length, males, 25.3 inches, females, 26 inches; tail vertebræ, males, 10 inches, females, 11.4 inches; hind foot, males, 3 inches, females, 2.8 inches. Found in "Southern Washington and northern Oregon, east of the Cascades; exact limits of range unknown." (Howell)

Great Basin Skunk.—*Mephitis occidentalis major* (Howell).

Larger than typical *occidentalis*, with longer hind foot; white dorsal stripes broad, dividing about middle of back, not extending far onto tail; tail largely black. Total length, males, 28 inches; tail vertebræ, 12.2 inches; hind foot, 3.4 inches. Found in "Eastern Oregon, northern California, and Nevada; east to the Wasatch Mountains in Utah." (Howell)

Southern California Skunk.—*Mephitis occidentalis holzneri* Mearns.

Not differing appreciably from typical *occidentalis* in color, but smaller in size. Total length, males, 26 inches, females, 24 inches; tail vertebræ, males, 11.8 inches, females, 11.8 inches; hind foot, males, 2.8 inches, females, 2.6 inches. Found in "Southern California, from vicinity of Monterey Bay south into Lower California; east to the Sierra Nevada and San Bernardino Range; limits of southward range unknown." (Howell)

Broad-nosed Skunk.—*Mephitis platyrhina* (Howell).

Resembling typical *occidentalis* externally but differing in cranial characters; white stripes of medium breadth; tail black, with indistinct white band on upper surface. Total length, males, 30 inches; females, 27 inches; tail vertebræ, males, 13 inches, females, 13 inches; hind foot, males, 3.6 inches, females, 3.2 inches. Found in Kern County, California.

Subgenus *Leucomitra*. Hooded Skunks

Northern Hooded Skunk.—*Mephitis macroura milleri* (Mearns).

Size medium, markings extremely variable. Two phases occur, one in which upperparts are nearly all white, underparts black; the other in which upperparts are chiefly black, with narrow white stripes on sides and white on underside of tail; various degrees of intergrading between these two

extremes may be seen. Total length, males, 27 inches, females, 26.5 inches; tail vertebræ, males, 14 inches, females, 14 inches; hind foot, males, 2.6 inches, females, 2.4 inches. Found in southern Arizona and south into Mexico.

* * * * *

The Large Striped Skunks are marked by a revealing color pattern, a coat that advertises its owner, and by its very conspicuousness warns. Skunks are not liable to confusion with any other mammals since only Skunks (in North America) have this black pelage striped with contrasting white, and the long bushy tail. The unmistakable character of identification is the unique weapon of defense possessed by Skunks and which once experienced will never be forgotten. The heavy build, large size, and broad, unbroken stripes of white easily distinguish this genus from *Spilogale*. From the other genus of large Skunks, *Conepatus*, they may be told by the differences enumerated under the discussion of the Hog-nosed Skunk.

The Large Striped Skunk is usually encountered about clearings, pastures, or open ground near the borders of forest. It is also found on the plains and prairies, seeking cover in the brush along water-courses or in broken country. The animals may be seen upon occasion at any hour of the day, but generally begin their hunting late in the afternoon. They are most active at night. They are slow-moving and deliberate, with great confidence in their powers. Much of their food is obtained by digging and rooting about under the sod. They dig a burrow or use an old Badger hole or other ready-made hole in the ground, and the female makes a grass nest for the young.

These may number as high as ten to a litter, but from four to six is the average number. The young are born the latter part of April or early in May.

The scent of the Skunk is contained in a pair of anal glands which are enclosed in a heavy sheath of muscle and under control of the animal. These glands discharge through a duct which is protruded from the anus when the animal is angered, but normally occupies an internal position. By a powerful muscular contraction the fluid of the gland is ejected in a fine, almost invisible, spray or mist to a distance of eight or ten feet. Down wind the spray itself will travel much farther and the rapid diffusion of this substance will taint objects for many

feet in all directions, on a still day. The Skunk is loathe to eject this fluid if it can possibly be avoided and will put up with a surprising amount of abuse (sometimes) before losing restraint. The usual posture of defense is head low and toward the enemy, tail stiffly erect, and the hairs of the tail distended. This is an obvious warning and if not crowded the Skunk will usually soon assume a less tense attitude. As long as the tail is lowered and less rigid the Skunk will not fire.

The animal can aim the discharge and not only is he effective upon an enemy to the rear, but even upon one that is facing the Skunk. No position is safe within a circle of two or three yards.

The fluid from these scent-glands is a clear yellow in color, strongly acid in reaction, and said to be slightly luminous after dark. It is exceedingly painful if it falls into the eye and may cause temporary or possibly permanent blindness. Clothing which has been saturated with this spray will retain an odor for days and weeks, although burying the garments in the ground will hasten their return to normalcy. One discharge from the glands does not empty them; they are capable of a number of salvos.

It is possible to kill a Skunk so that there is no emission from the glands. The surest way is to drown the Skunk. Shooting usually results in a drenched atmosphere unless the spinal cord is cut. It has been stated that if the tail of the Skunk can be kept lowered, the animal is defenseless, and there are various ways in which the Skunk may be dispatched which depend upon this fact for their efficiency. The animal may even be caught alive if the tail is grasped and kept down. My own experience is that the element of risk is so great, and the likelihood of some part of the scheme not developing as per schedule so imminent, that I would class these latter methods as impractical for the layman.

Skunks make very interesting pets and Merriam, Seton, and others have written accounts of their experiences with these mammals which show a surprising side to Skunk nature. They are playful and affectionate and show a nice regard as to the abuse of their powers. By a bit of minor surgery Skunks can be rendered incapable of discharging musk and are then as innocuous as Cats.

Skunks become very fat in the fall and den up during the

severe weather. The fur of these mammals has become quite popular in recent years and a large traffic is done in Skunk pelts. The dark-colored ones fetch the best prices and the fur of a prime skin is deep, durable, and handsome.

Genus *Conepatus*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{2}$; Molars, $\frac{1}{2}$ = 32.

Hog-nosed Skunk.—*Conepatus mesoleucus mearnsi* and related forms

Names.—Hog-nosed Skunk; White-backed Skunk. Plate X.

General Description.—About the same size and build as the species of *Mephitis*; a large, robust Skunk with conspicuous black and white coloration; a broad unbroken band of white from crown to end of tail; differs from *Mephitis* also in having a naked, hog-like muzzle and much smaller, less bushy, tail.

Color.—Sexes colored alike; no marked seasonal variation but considerable individual variation.

Upperparts.—From crown to end of tail pure white to white with faint yellowish tinge, extending as a band from head to shoulders and then widening out to cover nearly the entire dorsal region; rest of upperparts brownish black to black.

Underparts.—Blackish except for tail which is white with a few black hairs.

Immature much like adults.

Measurements.—Males larger than females. Total length, males, 27 inches, females, 23 inches; tail vertebræ, males, 11.6 inches, females, 9 inches; hind foot, males, 3 inches, females, 2.8 inches. Weight five to ten pounds.

Geographical Distribution.—From the states along the border south into Mexico.

Food.—Many varieties of insect food such as beetles and their larvæ, grasshoppers, crickets, grubs, etc.; small rodents; small birds and their eggs; fruit of cactus.

Enemies.—Usually let alone by most predatory animals but occasionally killed by Great Horned Owls, and perhaps, in times of food scarcity, by Coyotes and Bobcats.

Species and Subspecies of the Genus *Conepatus*Subgenus *Oryctogale*

This genus is southern in its distribution, ranging from the southern end of South America up through Central America and reaching its northern limit just north of the Mexican boundary.

Mearns Hog-nosed Skunk.—*Conepatus mesoleucus mearnsi* Merriam.

As described above. Found in western Texas and south beyond the Rio Grande, east as far as Austin.

Swamp Hog-nosed Skunk; White-backed Skunk.—*Conepatus mesoleucus telmalestes* Bailey.

Resembling *mearnsi* but with lighter dentition and more slender skull. "Whole upperparts and tail white, the white extending forward on forehead nearly to eyes; lower parts, sides, legs, and face black." (Bailey) Total length, males, 25 inches; tail vertebræ, 10.3 inches; hind foot, 3.1 inches. Found in a small section of Texas included in the counties of Liberty, Hardin, San Jacinto, Montgomery, and Harris.

Arizona Hog-nosed Skunk.—*Conepatus mesoleucus venaticus* Goldman.

Resembling *mearnsi* in size and color but differing in cranial characters. Found in "Southeastern Arizona and adjacent parts of New Mexico. . . ." (Goldman)

Texas Hog-nosed Skunk.—*Conepatus leuconotus texensis* Merriam.

Size large; white dorsal area more restricted than in *mearnsi*, generally only a narrow stripe on rump and sometimes completely cut off to leave rump black. Underside of tail with much black. Total length, males, 33 inches, females, 28 inches; tail vertebræ, males, 14.5 inches, females, 11.8 inches; hind foot, males, 3.4 inches, females, 3 inches. Found in the "Coast strip of Texas from Rockport, Aransas County, to mouth of Rio Grande." (Merriam.)

* * * * *

The Hog-nosed Skunk is about the same size as the Large Striped Skunk and more or less similarly colored, but differs in having a hog-like muzzle, a smaller tail, and a single, broad band of white down the back instead of a pair of lateral bands separated by a black dorsal strip. In general behavior and skunk-like attributes the two genera are much alike, except that the Hog-nose is more of a digger, as would be indicated by the special development of a rooting muzzle.

Subfamily **Taxidiinæ**. American Badgers

Form robust; legs short; toes not webbed; claws large and strong, fossorial in type; tail moderately short; pelage long and loose.

Genus **Taxidea**

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{2}$ = 34.

American Badger.—*Taxidea taxus*

and related forms

Names.—American Badger; Common Badger; Blaireau (French Canadian). Plate XI.

General Description.—A large, powerful member of the Weasel family, with heavy body; short, bushy tail; long,



FIG. 32. American Badger

shaggy pelage; and grizzled gray color. Head comparatively small, broad and flat rather than rounded; ears low and rounded; neck short; body low and squat, robust; legs short and powerful; feet with five toes, claws large and well developed, especially on forefeet where they are over an inch in length; tail short, thick and bushy; pelage very long and loose; habit semifossorial.

Color.—Sexes colored alike; no marked change in color with the seasons.

Upperparts.—Silvery gray grizzled with black in general impression, the hairs dirty gray at base, then grayish white followed by a narrow black band and tipped with silvery

white; pelage on head much shorter than on body; a narrow whitish stripe from muzzle to shoulders, and whitish patch on face below eye and on ear; sides of muzzle, a spot in front of ear, top of head, and back of ear dusky gray; fore- and hind feet blackish.

Underparts.—Yellowish white to soiled whitish, the pelage much shorter than on back.

Immature very similar to adults but generally less grizzled.

Measurements.—No marked difference in size between sexes. Total length, 28 inches; tail vertebrae, 5.5 inches; hind foot, 4 inches; weight, 13-14 pounds average up to maximum of 23.

Geographical Distribution.—Central North America from Saskatchewan south.

Food.—Small mammals such as Ground Squirrels, Prairie-dogs, Mice, Pocket Gophers, etc.; birds and eggs; sometimes insects.

Enemies.—Probably able to avoid, under normal circumstances, the only animals powerful enough to prey upon it, namely, the large carnivores.

Species and Subspecies of the Genus *Taxidea*

Common Badger.—*Taxidea taxus taxus* (Schreber).

As described above. Found from about 55° latitude in Alberta, Saskatchewan and Manitoba south to Colorado and Kansas, east to Michigan and west across the Rocky Mountains.

Colorado Badger.—*Taxidea taxus phippsi* Figgins.

Resembling typical *taxus* but larger and darker. General color as in *taxus*, but dark areas on head and face extensive and black; white stripe down head and neck reaching to shoulders. Total length, 30 inches; tail vertebrae, 5 inches; hind foot, 4.7 inches. Found in southern Colorado, limits of range unknown.

Texas Badger; Mexican Badger.—*Taxidea taxus berlandieri* (Baird).

Resembling typical *taxus* but with slightly more buff and with the white line on head and neck running onto back sometimes as far as tail. Found in the western half of Texas, west through Arizona into southeastern California.

California Badger; Western Badger.—*Taxidea taxus neglecta* (Mearns).

Differing from typical *taxus* in having less black which is replaced by dark brown or dusky; upperparts grizzled gray

and dusky; white stripe on head and neck sometimes to shoulders and even to rump; dark markings on head and face dusky to blackish; underparts buffy; tail yellowish brown above, paler beneath. Total length, 29 inches; tail vertebræ, 5.4 inches; hind foot, 4 inches. Found in the western states from Washington and Oregon south through California.

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The low, squat form of the Badger, in conjunction with the grizzled grayish color, white face markings, and long pelage, is a field character which serves for easy identification of this mammal.

Badgers are creatures of the prairies, plains, and open forests. They dig out much of their prey and the range of the genus in North America coincides rather closely with the region of greatest rodent abundance, the home of the Ground Squirrels, Prairie-dogs, etc. The Badger does not go into heavy stands of timber, for there would be little there which he could hunt; he can not climb and is not swift in the chase.

Badgers are most active from late afternoon on, but may be noted moving about at any hour of the day. The commonest proof of their presence is the abundance of large holes they dig. When these animals dig out a Ground Squirrel or a Gopher they make a large, deep hole which may remain open for a matter of several years before rains or other natural causes fill it in. Badgers are industrious and where hunting has been good badger-holes are thick. Ranchmen are often annoyed by these rodent hunters when they excavate in the alfalfa fields or sink pits where a saddle Horse may be tripped and have a leg broken. The redeeming feature of this Badger activity is that each hole means the death of one or more rodent enemies of the rancher.

The Badger is a fearless little beast and when caught away from a hole turns upon an enemy with such snarling fury that it commands immediate respect. It is very tough and tenacious of life. Blows that would kill the ordinary mammal produce no effect upon a Badger. The heavy pelage is probably some protection to the animal under such circumstances, but its compact, muscular build enables it to withstand terrific shocks. If the Badger is allowed only a moment to dig, it needs no weapon of defense, for it can disappear below the surface in a surprisingly short time.

A Badger that I once came upon as he began digging out a Squirrel was only just below the surface and the ejected earth was flying forth in leisurely spurts. The Badger sensed my footsteps as I drew near and immediately changed his tempo. Muttered snarling and rumbling began to pour out of the hole, and a geyser of earth leaped up four or five feet into the air. As I looked on, the height of this earth column dropped almost with the seconds and in a very short time the Badger was so deep that no more earth reached the surface and the sounds of his subterranean rage were only faintly audible.

The number of young in a Badger litter is three as an average and ranges from one to five. The young are born late in the spring, May to early June. In regions of severe winters the Badger dens up until the snow has melted. Seton gives the period of hibernation in Manitoba as lasting from the time the ground freezes until April.

Badger fur, while thick and handsome in color, is rather coarse and is not valued very highly.

Family **Canidæ**. Wolves, Coyotes and Foxes

Medium-sized carnivores of dog-like form; head dog-like, with elongate muzzle; legs rather long; feet digitigrade, with four or five digits; claws non-retractile; tail long and unusually bushy; dentition of shearing-crushing type, with well-developed carnassial teeth; pelage rather long and thick; habit terrestrial.

Subfamily **Caninæ**

Genus **Vulpes**

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{3}$ = 42.

Red Fox.¹—**Vulpes fulva**

and related forms

Names.—Red Fox; Cross Fox; Silver Fox; Black Fox; Silver-gray Fox. Plate XII.

¹ For a *Preliminary Revision of the North American Red Foxes* see C. H., Merriam, *Proc. Wash. Acad. Sciences*, Vol. 2, pp. 661-676, Dec., 1900.

General Description.—Resembling a small, sharp-nosed Dog of slender build; ears large and erect; pupil of eye linear; muzzle long and slender; tail long and bushy; claws fairly long and sharp; pelage long and soft.

Color.—Sexes colored alike; slight seasonal variation; occurring also in several color phases.

Upperparts.—Bright golden yellowish, slightly darker along mid-dorsal region, rump grizzled lightly with whitish;



FIG. 33. Red Fox

head reddish yellow, grizzled with whitish; forefeet to elbow black; hind feet black; tail yellowish, mixed with black, a black spot on upper surface near base, tip white.

Underparts.—White.

Immature have blackish on muzzle and back of ears; dusky on head and tail; very young dull yellowish brown or drab in general color.

Measurements.—Males larger than females. Total length, males, 41 inches; tail vertebræ, 16 inches; hind foot, 6.5 inches.

Geographical Distribution.—Most of the United States and Canada.

Food.—Birds, small mammals, principally Mice, small rodents and Rabbits, fruit and berries.

Enemies.—Eagles, Wolves, Lynxes, Fishers; other carnivores also catch young Foxes.

Species and Subspecies of the Genus *Vulpes*

There is considerable similarity in general color pattern between all the forms of North American Red Foxes. The typical pelage for each form is reddish yellow and the variations are not sufficient to conceal the very obvious identity of the animal. Most of the forms, perhaps all, occur in three distinct color phases. The common pelage is the Red phase; the rarest is the Black or Silver phase, which is simply a melanistic specimen, black with more or less silver-tipped hairs. The Cross Fox is an intermediate phase and while rare is much more common than the Black phase. The Cross Fox is reddish yellow above except for a dark band across shoulders which, with the dark dorsal band, forms a rough figure like a cross; a broad band of blackish from chin down throat and belly. Plate XII.

These three phases may occur in the same litter and some forms of *Vulpes* seem to produce these color variations oftener than others.

Fulva Group. Red Fox

Eastern Red Fox.—*Vulpes fulva* (Desmarest).

As described above. Found in the northeastern United States.

Long-tailed Red Fox.—*Vulpes macroura* Baird.

"Size and general appearance of *fulva*, but *tail much longer*; hind feet larger; black of feet and legs much less extensive." Total length, males, 41 inches; tail vertebræ, 18.5 inches; hind foot, 7 inches. Found in "Mountains of Colorado, Utah, and Wyoming." (Merriam)

High Sierra Red Fox.—*Vulpes necator* Merriam.

Resembling *fulva* in general color, but sides of nose much darker, less black on legs, dorsal region duller and redder. Total length, males, 40 inches; tail vertebræ, 15.2 inches; hind foot, 6.8 inches. Found in "Southern or High Sierra, California." (Merriam)

Cascade Red Fox.—*Vulpes cascadiensis* Merriam.

"A short-tailed small-toothed mountain fox of the *fulva* group, commonest in the 'black-cross' pelage; when in red pelage, yellow instead of fulvous." (Merriam) Upper-parts straw-yellow, dorsal region golden yellowish; tail very pale; black on ears and feet reduced. Total length, males, 43 inches; tail vertebræ, 16.5 inches; hind foot, 7.1 inches. Found in "Cascade Range in Oregon and Washington, and northern Sierra Nevada in California; northern limit unknown." (Merriam)

Nova Scotia Red Fox.—*Vulpes rubricosa rubricosa* (Bangs).

"Size rather large; color deepest and darkest of all the red foxes; tail large, very broad and bushy, and deep fulvous." (Merriam) Upperparts rich dark fulvous; feet black but not as extensively so as in *fulva*. Total length, females, 43 inches; tail vertebræ, 16 inches; hind foot, 6.6 inches. Found in "Nova Scotia—limits unknown." (Merriam)

Labrador Red Fox.—*Vulpes rubricosa bangsi* Merriam.

"Similar externally to *fulva* but ears smaller; black of ears and feet more restricted." Found in "Labrador—limits unknown." (Merriam)

Newfoundland Red Fox.—*Vulpes deletrix* Bangs.

"Color very pale—light straw yellow, deepening in places to golden yellow or even buffy fulvous; black of feet restricted; tail pale buffy yellowish with usual admixture of black hairs, but without black basal spot. Hind feet and claws very large." (Merriam) Total length, females, 38.4 inches; tail vertebræ, 13.5 inches; hind foot, 6.5 inches. Found in Newfoundland.

Alaska Red Fox.—*Vulpes alascensis alascensis* Merriam.

"A large long-tailed red fox closely related to *V. vulpes* of Scandinavia and Siberia, and also to *rubricosa* and *bangsi* of Nova Scotia and Labrador. Color golden fulvous; tail very long; ears small; black of feet greatly restricted; pelage of neck and anterior part of back long and full, almost forming a ruff; pelage of posterior part of back and rump shorter and coarser." Found in "Northern Alaska—limits unknown." (Merriam)

British Columbia Red Fox.—*Vulpes alascensis abietorum* Merriam.

Similar to typical *alascensis* but differing in longer and more slender skull. Found in "Interior of British Columbia and probably southeastern Alaska." (Merriam)

Kenai Red Fox.—*Vulpes kenaiensis* Merriam.

Size large; external characters unknown. Found in "Kenai Peninsula; limits of range unknown." (Merriam)

Kodiak Red Fox.—*Vulpes harrimani* Merriam.

"Size large; tail enormous, constricted at base, largest on basal fourth and tapering thence to tip; pelage coarse, wolf-like on tail and posterior half of back; hairs of neck and shoulders greatly elongated, forming a conspicuous ruff; those of posterior half of back abruptly much shorter and conspicuously grizzled." (Merriam) Upperparts yellowish fulvous, brightest on anterior half of back, grizzled on head and rump; underparts buffy with grayish buffy on chin, throat, and inguinal region; ears black. Total length, males, 52 inches; tail vertebræ, 18 inches. Found on Kodiak Island, Alaska.

Northern Plains Red Fox.—*Vulpes regalis* Merriam.

"Size largest; ears very large and broad; tail very long but diameter less than in *rubricosa*; sexual difference in size

great; color a beautiful golden yellow, becoming almost buffy-white on face and posterior part of back; legs abruptly dark fulvous; black of feet very pure but restricted in area." (Merriam) Total length, males, 45 inches; tail vertebræ, 17 inches; hind foot, 7 inches. Found on "Northern Plains from Dakota to Alberta; east to Manitoba and Minnesota; limits unknown." (Merriam)

Velox Group. Kit Foxes

The members of this group are all small, and while belonging to the same genus as the Red Foxes, they are colored quite differently. The Kit Foxes are the smallest of the New World Foxes.

Kit Fox; Swift.—*Vulpes velox velox* (Say). Plate XII.

A very small, delicately-built Fox. Upperparts buffy yellow, lightly frosted with white-tipped hairs and sprinkled with black-tipped hairs; yellowish brown back of ears and outer sides of limbs; a black spot on side of snout; tail above buffy gray, below, yellower, tip black, a black spot on upper-side of tail near base; underparts whitish. Total length, 26 inches; tail vertebræ, 9 inches; hind foot 4 inches. Found in the Great Plains region from New Mexico north into Saskatchewan, Canada.

Prairie Fox.—*Vulpes velox hebes* Merriam.

Larger than typical *velox* and grayer. Upperparts reddish gray in summer, dark buffy gray in winter; blackish on tip of tail and sides of nose. Total length, 34 inches; tail vertebræ, 12.5 inches; hind foot, 5.2 inches. Found from southeastern British Columbia and southwestern Saskatchewan south to Wyoming; east into North Dakota.

Long-eared Kit Fox.—*Vulpes macrotis macrotis* Merriam.

Color very pale, size small, ears very large. Upperparts pale grayish buff; chestnut or sepia on tip of tail and small spot on upperside near base; underparts buffy white, chest buffy. Total length, 30 inches; tail vertebræ, 11.6 inches; hind foot, 4.8 inches. Found in southwestern California, from Los Angeles County south; Lower Sonoran Zone.

San Joaquin Kit Fox.—*Vulpes macrotis mutica* (Merriam).

Larger than typical *macrotis*, hind foot and tail longer, back browner. Total length, 38 inches; tail vertebræ, 14 inches, hind foot, 5 inches. Found in the San Joaquin Valley, California; Lower Sonoran Zone.

Desert Kit Fox.—*Vulpes macrotis arsipus* (Elliot).

Differing from typical *macrotis* in paler color, smaller size, and different cranial characters. Upperparts grizzled gray; mixed pale gray and light brownish on head; sides gray with buffy tinge; black patch on sides of nose from eye and on either side of chin; underparts whitish. Total length, 32.5

inches; tail vertebræ, 12.5 inches; hind foot, 5 inches; ear from notch, 3.4 inches. Found in California on Colorado and Mohave Deserts, west to Palm Springs, Riverside County, and north into Inyo County; Lower Sonoran Zone.
New Mexico Desert Fox.—*Vulpes macrotis neomexicana* Merriam.

Larger than typical *macrotis*, with larger skull and heavier teeth. Total length, 33 inches; tail vertebræ, 12 inches; hind foot, 5.4 inches. Found in the Lower Sonoran Zone in southern Arizona, New Mexico, and southwestern Texas; limits of range unknown.

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The Red Fox needs little introduction to the layman for it is one of the common mammals of literature and zoological parks. From Æsops Fables to the daily press the Fox is frequently figured or his characteristics referred to in some way. Consequently most of us know the Fox by reputation at least.

Regardless of where it is found or which species it represents, the Red Fox is easily recognized because of its bright reddish or fulvous color and its big, bushy tail. The several color phases, Cross, Silver, or Black Foxes, although quite different in color from the Red Fox, show all the other typical Fox characters so clearly that they should be confused with no others of the Canidæ.

Red Foxes prefer areas of diversified topography and environment. Although they range over the prairies and forested sections they do not haunt the heavy, continuous stands of unbroken timber nor do they live on open, brushless plains. Cover of some sort and suitable hunting grounds are part of this animal's preferred environment. The individual Fox does not seem to travel over a very extensive range, and throughout the year usually does not cover an area of more than five to ten miles across.

Red Foxes are most active at night but move about during the day as well and may be encountered at any hour. They are alert, wary, and have keen eyes, ears, and noses. The track of a Red Fox is very much like that of a small Dog. These mammals dig burrows into banks or hillsides or have dens in old hollow logs or stumps. The young are born in March or April and number from four to nine. Both parents share in the care of the family and are very solicitous of the young.

The Kit Fox is much smaller than the Red Fox and is a

plains or prairie dweller, spending rather more of its time in burrows and is less cunning than its red relative. Its general habits are somewhat modified from those of the Red Fox because it is an open country animal, but the details of its family life are about the same.

The fur of the Red Fox and its color phases, Cross, Silver, and Black, is very valuable and one of the favorites of the fur trade. Prime Silver or Black Foxes fetch very high prices and are successfully reared on fox farms or ranches. The pelt of the Kit Fox is not so valuable and does not command a very good figure.

Foxes have several calls, the commonest a short yapping bark, given by Seton as "yap-yurr," a long yell, and a shrill squall uttered by the female in the mating season.

Genus *Urocyon*

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 42.

Gray Fox.—*Urocyon cinereoargenteus*

and related forms

Names.—Gray Fox; Colishé; Tree Fox. Plate XIII.

General Description.—Typically fox-like in appearance; muzzle fairly long; ears erect; tail long, bushy, and with a



FIG. 34. Tail of Gray Fox, with hair parted to show concealed mane of stiff hairs

concealed mane of stiff hairs; soles of feet furry; pupil of eye elliptical.

Color.—Sexes colored alike and color pattern not varying much with season, variation consisting chiefly in longer pelage in winter and slightly brighter shades in fresh pelage.

Upperparts.—Grizzled gray and black, pepper-and-salt, lighter on sides, marked with reddish brown about ears, sides of neck, sides of forelegs and “ankles”; muzzle blackish, tail heavily marked with black; cheek and inside of ear clear white.

Underparts.—White with tawny along lower sides and tail; blackish on chin.

Measurements.—Females approximately same size as males. Total length, about 40 inches; tail vertebræ, 12 inches; hind foot, 5 inches; weight about 8 pounds.

Geographical Distribution.—United States from region of Great Lakes east to Atlantic seaboard, south to Texas; in western states along Pacific coast to Washington and north in interior to Wyoming.

Food.—Small mammals, birds, reptiles, fish, fruit, berries, acorns, mushrooms; practically omnivorous.

Enemies.—Not much has been recorded on this point, but possibly occasionally caught by Lynx in the northern part of its range, and young Foxes caught by Eagles, Great Horned Owls, Coyotes, Wolves, etc.

Species and Subspecies of the Genus *Urocyon*

Eastern Gray Fox.—*Urocyon cinereoargenteus cinereoargenteus* (Schreber).

As described. Found in eastern United States from Virginia north into New England and west to the Great Lakes region, south to meet the range of *floridanus*; limits of range unknown.

Northern Gray Fox.—*Urocyon cinereoargenteus borealis* Merriam.

Described as considerably larger than typical *cinereoargenteus*, with different skull and tooth characters. Taken near Monadnock, New Hampshire; limits of range unrecorded.

Florida Gray Fox.—*Urocyon cinereoargenteus floridanus* Rhoads.

Smaller than typical *cinereoargenteus*, with harsher pelage and shorter ears, tail, and hind foot; underparts fulvous. Total length, 36 inches; tail vertebræ, 10.5 inches; hind foot, 5 inches. Found from Florida west to eastern Texas.

Wisconsin Gray Fox.—*Urocyon cinereoargenteus ocythous* Bangs.

Larger than typical *cinereoargenteus*, with longer tail and hind foot; general coloration not so gray, more yellowish. Total length, 41 inches; tail vertebræ, 15.5 inches; hind

foot, 5.5 inches. Found in the upper Mississippi Valley from Wisconsin south; limits of range unknown.

Arizona Gray Fox.—*Urocyon cinereoargenteus scotti* (Mearns). Ears and tail longer than in typical *cinereoargenteus*, form more slender, color grayer and with more yellowish fulvous. Total length, 39 inches; tail vertebræ, 16 inches; hind foot, 5.3 inches. Found from the western half of Texas and western New Mexico west through Arizona and southern California, north as far as Inyo County.

Urocyon cinereoargenteus texensis Mearns = *U. c. scotti*

Urocyon cinereoargenteus inyoensis Elliot = *U. c. scotti*

California Gray Fox.—*Urocyon cinereoargenteus californicus* Mearns.

Smaller than typical *cinereoargenteus*, ears and tail relatively longer. Upperparts grizzled gray mixed with black and general pattern very much as in *cinereoargenteus*. Total length, 38 inches; tail vertebræ, 15 inches; hind foot, 5.2 inches. Found in central and southern California in Upper Sonoran and Transition Zones, exclusive of humid coast belt and eastern desert tracts.

Redwood Gray Fox.—*Urocyon cinereoargenteus sequoiensis* (Dixon).

With more rufous on sides of head, neck, belly, and feet than in *californicus*. Total length, 39 inches; tail vertebræ, 16 inches; hind foot, 5.4 inches. Found in the humid coast belt of California from Lake County south to Monterey Bay.

Townsend Gray Fox.—*Urocyon cinereoargenteus townsendi* (Merriam).

Large in size; ears smaller than in *californicus* and with more intense fulvous tints, but not so intense as in *sequoiensis*. Total length, 42 inches; tail vertebræ, 17 inches; hind foot, 5.8 inches. Found in northern California from the Mount Shasta region to the interior of Humboldt County, in Upper Sonoran and Transition Zones.

San Miguel Island Fox.—*Urocyon littoralis littoralis* (Baird). Resembling *californicus* in color pattern but much smaller in size. Total length, 29 inches; tail vertebræ, 10 inches; hind foot, 4.4 inches; weight about 4.5 pounds. Found only on San Miguel Island, Santa Barbara group, California.

Santa Cruz Island Fox.—*Urocyon littoralis santacruzæ* Merriam.

Brighter in color than typical *littoralis* and with different skull characters. Total length, 28 inches; tail vertebræ, 10.5 inches; hind foot, 4.3 inches. Found only on Santa Cruz Island, Santa Barbara group, California.

San Clemente Island Fox.—*Urocyon clementæ* Merriam.

Differing from *littoralis* in smaller skull, more tapering nasals, and slender rostrum. Found only on San Clemente Island, Santa Barbara group, California.

Santa Catalina Island Fox.—*Urocyon catalinae* Merriam.

Tail longer than in *littoralis* and with different skull characters. Total length, 30 inches; tail vertebræ, 11.4 inches; hind foot, 4.5 inches; ear from crown, 2.5 inches. Found only on Santa Catalina Island, Santa Barbara group, California.

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The Gray Fox looks very much like his red relative, aside from color, but is a trifle longer in the leg. Although the ranges of the Gray and Red Foxes overlap, the Gray Foxes are more abundant in the warmer parts of North America and even are found on deserts, while the Red Foxes show more preference for the cool regions. The Gray Fox often climbs up into low trees, another point in which he differs from the Red Fox.

The Gray Fox is found in various types of environment. In the eastern part of the United States and in parts of the West it is a forest-dwelling mammal, but in the Southwest it lives on the arid, open plains where it finds sufficient cover in the cactus and other desert vegetation. It is also found in brushy areas where thickets of low shrubbery afford hunting and hiding places. In favorable localities in the West it occurs in considerable numbers and is a common animal. It is chiefly nocturnal, but may hunt by day occasionally.

The Gray Fox does not possess the cunning of the Red Fox and not only is easier to trap but is far less suspicious of man and easier to observe. He will not run before hounds as well as the Red Fox and "trees" when close pressed or may seek refuge in some underground burrow. If the Dogs are slow the Gray Fox has little difficulty in losing them in rough and broken country. This Fox is said to have a series of dens, which are caves, fissures in cliffs, or hollow trees. Sometimes it digs its own burrows in the ground. These dens are used as refuges from enemies or as places to await the passing of severe winter weather. In the home den the mother Fox raises a litter of three to five young which are born from March to April. After the young are old enough to eat solid food the male Fox assists in bringing food to the den.

The fur of the Gray Fox does not take high rank in the fur trade and is much inferior to that of the Red Fox.

The calls of the Gray Fox, barks or yaps, resemble those of the Red Fox, but are a trifle coarser in timbre.

Genus *Alopex*

Dentition: Incisors, $\frac{3}{8}$; Canines, $\frac{1}{4}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{3}$ = 42.

Arctic Fox.—*Alopex lagopus*

and related forms

Names.—Arctic Fox; White Fox; Blue Fox; Polar Fox.

General Description.—A small Fox having rather short ears, soles of feet heavily furred, and muzzle proportionally shorter than in *Vulpes*; pelage very thick and long, color varying with the season; tail bushy. Plate XIII.

Color.—Sexes colored alike; a marked change with the seasons.

Summer.—Upperparts dark brown to slate color, with whitish to yellowish white on underparts, sides of neck, and flanks.

Winter.—Everywhere clear white.

Blue phase.—A color phase which bears about the same relation to the normal pattern as does the Black or Silver phase of the Red Fox to its more common pelage. Everywhere dark, smoky gray or bluish drab, sometimes with wash of sepia on head and feet and with a few white hairs sprinkled on throat and face. The "blue" animals do not turn white in winter.

Immature like adults in summer pelage.

Measurements.—Females very slightly smaller than males. Total length, 30 inches; tail vertebræ, 10 inches; hind foot, 4.5 inches; weight averaging around 10 pounds but varying from 5 to 20.

Geographical Distribution.—Arctic regions of Northern Hemisphere.

Food.—Small mammals, birds, eggs, fish, carrion, sea-urchins, etc.

Enemies.—Wolves, Polar Bears, and possibly (when young) Snowy Owls.

Species and Subspecies of the Genus *Alopex*.

Since there is such great similarity in color among the various forms of the Arctic Fox, the bases for separation are principally skull characters or differences in size.

Arctic Fox.—*Alopex lagopus lagopus* (Linnæus). Plate XIII.
As described. Restricted to Arctic regions of Europe and Asia, but said to reach Bering Island in Bering Sea.

Labrador Arctic Fox.—*Alopex lagopus ungava* (Merriam).
Distinguished from typical *lagopus* by differences in skull characters. Taken at Fort Chimo, Ungava, Canada, and south almost to 50°, thence ranging north to the Arctic Ocean and west to meet the range of *innuitus*.

Continental Arctic Fox.—*Alopex lagopus innuitus* (Merriam).
Slightly smaller than *ungava* and with broader braincase than in typical *lagopus*. Found in Arctic Alaska.

Greenland Arctic Fox.—*Alopex grænländicus* (Bechstein).
There is some doubt as to the validity of this name for the Greenland Fox. The original description has not been available to me. Greenland specimens in the American Museum are very similar to *ungava*.

Pribilof Fox.—*Alopex pribilofensis* (Merriam).
"Largest of the *lagopus* group. Skull much elongated, resembling that of a Red Fox more than that of the Arctic Foxes;" (Merriam). Blue phase predominating. Found on St. George Island and St. Paul Island, Pribilof group, Alaska.

Hall Island Fox.—*Alopex hallensis* (Merriam).
Smaller than *lagopus* and with shorter, broader skull. Found on Hall Island, Bering Sea, Alaska.

Bering Island Fox.—*Alopex beringensis* (Merriam).
Nearly equal to *pribilofensis* in size, with skull larger than in typical *lagopus*. Found on Bering Island, Aleutian Islands, Alaska.

* * * * *

The Arctic Fox, as its name implies, is a Fox of the northern wastes, and in its range it goes as far north as any mammal, being truly circumpolar in its distribution. It comes south until it meets the northern tree limit and its chosen home is the area of tundras and open, treeless lands where the winters are long and bleak and the summers short. The assumption of a white winter pelage is one of the adaptations with which this Fox meets the Arctic environment.

The Arctic Fox spends the short summer along the coast or on the open plains or rocky hillsides where bird life or small mammals are abundant. In winter it goes out on the ice and picks up a living on the food the sea affords. During the year the Fox may move a considerable distance to take advantage of the best feeding grounds and also as a response to overcrowding as the families of young grow up at the close of the summer. Arctic explorers report a regular migration on the part of these Foxes.

When the Arctic Fox goes out on the ice in winter it follows the Polar Bear and after this big hunter has fed on a Seal it feasts on what is left. This Fox does not hibernate and because of the difficulty of finding food the year around has developed the habit of storing such food as can not be eaten at once. Large numbers of Lemmings are killed and piled up in crevices in the rocks and other food supplies are hoarded against a day of want. The Arctic Fox will eat almost anything in the way of animal life, killing what it can itself, but taking what it finds killed for it. It is cannibalistic and does not hesitate to eat one of its own kind that is caught in a trap or disabled.

In disposition the White Fox is much more confiding and friendly than its more southerly relatives. It has a weak, dog-like bark or yelp and is not afraid to utter it when man appears. On the Pribilof Islands these Foxes are said to be very tame and to approach closely to parties which visit their home territory. This animal is largely nocturnal, but in a region where the normal relation of day to night runs such a wide range, it must be active to some extent by day as well. It is a very easy animal to trap and since the fur is deep and soft, it is taken in considerable numbers. The Blue Fox is especially valuable and prime skins have brought prices of \$100 to \$200 apiece in boom years. On some of the islands in Bering Sea these Foxes are reared for the fur market.

The young are generally born in June, the full season ranging from May to July, and number from one to eleven, with four or five as the average. The home den is located amongst the rocks or in burrows in sandy places.

Genus *Canis*¹

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{2}{2}$ = 42.

Coyote.—*Canis latrans*

and related forms

Names.—Coyote; Prairie Wolf. Plate XIV.

General Description.—A small, slender Wolf (total length about 42 to 48 inches) resembling a Shepherd Dog in many

¹ The Coyotes have been revised by C. H., Merriam, *Proceedings of the Biological Society of Washington*, Vol. xi, pp. 19-33, 1897, but the much more abundant material on hand today would justify new revision.

external characters; pelage fairly long and heavy, especially so in winter; tail large and bushy; easily identified by yapping howl.

Color.—Sexes colored very much alike; some seasonal variation.

Upperparts.—Coarsely grizzled buffy, grayish, and black; yellowish on muzzle, ears, and outer sides of legs; grizzled gray on top of head; tail above like back, below whitish near base, then pale yellowish, tip black.

Underparts.—Whitish, throat with some black hairs.

Immature pelage duller and grayer than adult.

Measurements.—Males noticeably larger than females. Total length, females, 49 inches; tail vertebrae, 16 inches; hind foot, 7.2 inches; weight of males, 35-40 pounds.

Geographical Distribution.—Western North America.

Food.—Small mammals, birds, lizards, snakes, insects, fruit, carrion.

Enemies.—Speed and wariness ordinarily save the Coyote from the large carnivores which would prey on it if they could. The Gray Wolf, Golden Eagle, and Great Horned Owl catch young Coyotes.

Species and Subspecies of the Genus *Canis*

Subgenus *Thos*

This subgenus contains the small Prairie Wolves or Coyotes. "The pattern of coloration is the same in all the Coyotes. Except in the pale desert forms (*pallidus* and *estor*), in which the fulvous tints are replaced by buff, the muzzle, backs of the ears, outside (sometimes the whole) of the fore and hind feet and legs, and distal half of the underside of the tail are some shade of fulvous. The ground color of the back also varies from buff, or even buffy-white in the desert forms, to dull fulvous in the animal from southern Mexico, and the abundance of black-tipped hairs is usually proportionate to the intensity of the ground color. The upperside of the tail is like the back, and about one-third the distance from root to tip it is marked by an elongated black spot. The tip is always black, although it sometimes contains a tuft of white hairs, most often present in *C. ochropus*. The males are decidedly larger than the females." (Merriam)

Northern Coyote; Brush Wolf; Say Coyote.—*Canis latrans* Say.

As described above; the largest of the Coyotes. Found on "Humid prairies and bordering woodlands of the northern Mississippi Valley, in Iowa and Minnesota, and northern edge of plains westward to the base of the Rocky Mountains in the Province of Alberta." (Miller)

Nebraska Coyote; Prairie Coyote; Prairie Wolf.—*Canis nebracensis nebracensis* Merriam [= *pallidus*].

Resembling *latrans* but smaller and paler; buffy back of ears instead of fulvous; no black-tipped hairs in "collar" as in *latrans*. Total length, 48 inches; tail vertebræ, 15 inches; hind foot, 8.2 inches. Found on "Arid plains from eastern Colorado to Montana and Assiniboia." (Miller).

Texas Coyote.—*Canis nebracensis texensis* Bailey.

Upperparts mixed buffy ochraceous and black; muzzle rusty reddish; top of head grizzled yellowish and gray; pale yellowish on nape, ears, and crown; underparts whitish, suffused with deep buffy on belly; long hairs of throat black-tipped; legs and feet yellowish, with mixture of black on external face; tail tipped with black. Total length, males, 46 inches; tail vertebræ, 14 inches; hind foot, 7.4 inches. Found in "Gulf region of Texas from Nueces Bay northward; probably throughout the lower Sonoran area of Texas, Oklahoma, and Indian Territory." (Miller)

Great Basin Coyote.—*Canis lestes* Merriam.

"Size large (next to *latrans*); ears and tail large; coloration almost as in *latrans*." Differing in cranial characters. Upperparts slightly paler than in *latrans*, "grayish buffy mixed with black hairs." (Merriam) Total length, males 45 inches; tail vertebræ, 13 inches; hind foot, 8 inches. Found in "Transition Zone from the dry interior of southern British Columbia, Washington, and Oregon southward over the higher lands of the Great Basin, the Sierra Nevada, and the Rocky Mountains to the plateau of northern Arizona, and thence along the continental divide to the Mexican boundary." (Miller)

Small-toothed Coyote.—*Canis microdon* Merriam.

"Size small; coloration rather dark; upper surface of hind foot whitish; belly sprinkled with black-tipped hairs; carnassial and molar teeth very small." (Merriam) Total length, males, 43 inches; tail vertebræ, 13 inches; hind foot, 7.4 inches; weight, 28 pounds. Found in "Arid tropical or Tamaulipan region of northeastern Mexico and the lower Rio Grande region of Texas." (Miller)

Mearns Coyote.—*Canis mearnsi* Merriam.

"Size small; ears medium; coloration rich and bright, the fulvous tints exceedingly bright and covering the whole of the fore and hind legs and feet. Skull and teeth small." (Merriam) Total length, females, 44 inches; tail vertebræ, 13 inches; hind foot, 7.2 inches. Found in "Lower

Sonoran areas of northern Sonora and southern Arizona." (Miller)

Desert Coyote.—*Canis estor* Merriam.

Size small; coloration pale; teeth small. Upperparts buffy, with light sprinkling of black hairs; pale yellowish on muzzle; ochraceous buff on nape and ears; legs bright, deep buff; underparts whitish, long hairs of throat black-tipped; underside of tail ochraceous, black tip short. Total length, males, 42 inches; tail vertebræ, 12 inches; hind foot, 7.2 inches. Found in "Lower Sonoran deserts of eastern California, Nevada, and Utah." (Miller)

San Joaquin Valley Coyote.—*Canis ochropus* Eschscholtz.

"Externally similar to *C. latrans* and *lestes*, but smaller, darker, and much more highly colored, with very much larger ears, and very much smaller skull and teeth." (Merriam) Upperparts buffy ochraceous, sprinkled with black; tawny ochraceous on ears, legs, and underside of tail; muzzle grayish cinnamon; underparts whitish, with some buffy tinge; long hairs of throat and breast more or less tipped with black. Total length, males, 45 inches; tail vertebræ, 12 inches; hind foot, 7.2 inches. Found in "Lower Sonoran region of San Joaquin Valley, California." (Miller)

* * * * *

The voice of the Coyote is one of the most characteristic and distinctive mammal calls heard on the North American continent. Singly, or in twos or threes, these small Wolves "tune up" at sunrise or sunset and send a chorus of long howls and yapping barks on the still air. The Coyote frequently howls during the night and sometimes in broad daylight, but since he is a cautious beast, he is not so apt to advertise his presence after the sun is high. There is an indescribable quality in the howling of the Coyote which, to me, sets it apart from the obnoxious disturbance of a night-howling Dog and makes it a true voice of the wilderness.

It is granted that the stockman, the rancher, and the farmer may call down curses on the head of the Coyote. To many, however, who have heard this ecstatic little Prairie Wolf greet their camp-fire from out of the dusk, or have arisen at break of dawn and heard his frenzied hymn to the sun, a West without the Coyote seems colorless and flat.

In settled districts the Coyote may become troublesome, for he catches poultry and kills sheep. Furthermore, he quickly learns to avoid ordinary traps and the devices of the average hunter. Instead of retreating before the forces

of human occupation, he may merely change his habits and mode of life and remain, in spite of conditions which drive out the less adaptive mammals. Under these circumstances the Coyote will be seldom seen, skulking under cover in the daytime and coming out at night. In wilder areas where he has not been so impressed with the necessity of avoiding man, this little Wolf may be seen trotting through the sagebrush or watching from some slight eminence.

The Coyote bears enough resemblance to a tawny Shepherd Dog to be easily mistaken for one at a little distance. He can run much faster than the ordinary Dog, however, and only the specialized strains of running Dogs can hope to overtake a Coyote in fair chase. And once caught, he is more than a match for any Dog which is near his own size or weight.

In various parts of the West individual Coyotes have apparently contracted rabies and then has followed a season of "Coyote scare." As might be expected, such animals behave abnormally, show no fear of man, enter ranch enclosures, and become dangerous. Normally the Coyote is absolutely harmless, fleeing at the first suspicion of danger, and much less to be feared than the average stray Dog.

Coyotes are prolific and have about five to seven young in a litter. The number may vary from three to ten. The den is generally a hole in a bank or a hole back in the rocks, and the young are born early in April. Only one family is raised in a season.

Subgenus *Canis*. Wolves

The true Wolves of North America are all closely related and there are no sharp dividing lines to be drawn between them. Many names have been used and there is a great need for a revision of the Wolves. They should probably all stand as subspecies of *mexicanus*, the earliest-named North American Wolf.

Gray Wolf; Timber Wolf; Lobo; Loafer; Buffalo Wolf.—*Canis nubilus* Say, and related species. Plate XIV.

Displaying all the characters of the genus *Canis* as shown in the Coyotes, but much larger, heavier, and more powerful.

Color.—The same in both sexes and not varying much with the seasons, although varying much with the individual. Usual color pattern gray sprinkled with black or dusky on

upperparts; muzzle with light wash of brownish; legs and underparts yellowish white; soles of feet brownish. Individuals may be rusty red instead of grayish. Immature with blackish on muzzle, ears, and tail, but soon taking on gray of adult pelage.

Measurements.—Males larger than females. Total length, males, 64 inches, females, 56 inches; tail vertebræ, males, 16



FIG. 35. Timber Wolf

inches, females, 12 inches; hind foot, males, 10 inches, females, 10 inches; weight, males, 75–100 pounds average, to 150 for exceptional cases; females, 60–80 pounds.

Geographical Distribution.—All of temperate and Arctic North America except for a small area in the Southwest (California, Nevada, and parts of Oregon, Utah, and Arizona). Exterminated today over part of this range.

Food.—Carnivorous by preference, feeding on Deer, Moose, Caribou, Pronghorn, domestic stock, Jack Rabbits, Prairie-dogs, and all of the smaller mammals and birds it can catch; carrion; fish; rarely food of a vegetable nature.

Enemies.—Comparatively none when adult; when young, Eagles.

Species of the Subgenus *Canis*

Gray Wolf; Timber Wolf.—*Canis nubilus* Say. Plate XIV. As described. Limits of range unknown, but found on the Great Plains of Iowa, Nebraska, Kansas, Wyoming, the Dakotas, and east to the Great Lakes.

Northern Gray Wolf.—*Canis occidentalis* (Richardson).

A very large Wolf which is normally gray in color, but varies and may be dark bluish gray or almost black. Found in Mackenzie and the northwestern parts of forested Canada.

Eastern Timber Wolf.—*Canis lycaon* Schreber.

Reddish brown in color, with black-tipped hairs on back. Found in eastern Canada and the northeastern United States; limits of range unknown.

Florida Wolf.—*Canis floridanus* Miller.

Resembling *lycaon* in general cranial characters; light buffy gray mixed with black on upperparts; rusty red tinge on muzzle, legs and feet; also occurs as a black phase. Found in Florida.

Mt. McKinley Timber Wolf.—*Canis pambasileus* Elliot.

Variable in color from nearly uniform black to various mixtures of grizzled white and black; size very large. Found in the region of Mt. McKinley, Alaska; limits of range unknown.

Texan Red Wolf.—*Canis rufus* (Audubon and Bachman).

Smaller than the Gray Wolves; reddish brown in color with mixture of black; tail with black tip and much black on upper surface. Total length, 48 inches; tail vertebræ, 13 inches. Found throughout southern Texas, north at least to 30°; limits of range unknown.

Oklahoma Wolf.—*Canis frustror* Woodhouse.

A small Wolf most like *rufus* but not so red in color. Found in Oklahoma; limits of range unknown.

Puget Sound Wolf.—*Canis gigas* (Townsend).

A large, red Wolf. Upperparts reddish brown heavily sprinkled with black; underparts grayish; tail comparatively short and tipped with black. Found in the Puget Sound Region; south to California (?).

White Wolf; Tundra Wolf.—*Canis tundrarum* Miller.

A large, white Wolf. General color light yellowish white with faint sprinkling of dusky on back and tail; brownish on muzzle. Individuals may vary to almost black. Total length, males, 66.5 inches; tail vertebræ, 18.5 inches; hind foot, 11.75 inches; height at shoulder, 28 inches, weight, 90-100 pounds. Found on the Barren Grounds and tundras of Arctic America.

* * * * *

The Wolf has been so hunted and trapped by man that there are very few places in North America today where it can be readily observed. Although in the West there are regions where this mammal is yet to be found in fair numbers, the attempts to exterminate the Wolf have made him a very wary creature and he knows well how to keep out of sight. In the far North the big Arctic Wolves are probably as numerous

and as bold as they have ever been, for there the conditions are different.

The presence of Wolves will be oftenest noted by their big, dog-like tracks, occasionally by the deep, sinister howl, and possibly by the discovery of the kills they have made. The Wolf is strong enough to prey upon the largest of the non-carnivores and in some places is very destructive to domestic stock. With the settlement of a district, the establishment of farms and ranches, and the disappearance of the game animals, the Wolf departs as well. He has no place in the modern scheme and is being poisoned, trapped, and shot throughout the western states. In most of the eastern states the Wolf has been exterminated or is very scarce; in the Adirondacks the last Wolf was killed in 1893, in Pennsylvania in 1907, and in New Jersey they were all killed early in the nineteenth century.

The hunting range of an individual Wolf is usually very extensive. The animal is capable of traveling far and swiftly, and it follows the larger mammals which it prefers as prey.

The Wolf frequents the plains, the broken country where plateaus are intersected by canyons and ravines, and the forests. It is able to adapt itself to a variety of environments, but needs either dense, inaccessible cover or a wide expanse of territory where its speed will serve it in place of adequate cover.

The Wolf makes its den in a cave, a hollow log, or in a hole in the ground. The location is generally selected near a rise of ground from which one of the Wolves can stand guard. The young vary in number from three to thirteen, with six or seven as the average. The young are born from early March to the middle of April. The old Wolves are devoted parents and the male helps the female to feed and rear the young. When born the pups are blind and the eyes are not fully opened until the ninth day.

Wolves hunt together, usually in small packs. These packs may be the individuals of one family or, in winter, several families may be represented, and at this time the packs are larger; at other seasons large packs are unusual.

Seton gives several calls for the Wolf. The commonest is the "long smooth howl" very much like the howl of a large Dog but decidedly eerie, nevertheless. Another howl is on a

higher pitch, vibrating on two notes. A third cry is a combination of a short bark and howl and is given when the Wolf is in full cry on a hot scent.

Family **Felidæ**. Cats

Carnivorous mammals of medium to large size; form muscular and trim; head rounded; limbs of moderate length; feet digitigrade, toes five in front, four behind; claws long, sharp, retractile; tail short to long; dentition of shearing type without broad, crushing surfaces; carnassial teeth highly developed; tongue with upper surface rasp-like; habit terrestrial but able to climb trees; pelage fairly short to moderately long.

Genus **Felis**

Dentition: Incisors, $\frac{3}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{1}{1}$ = 30.

Cougar.—**Felis cougar**¹

and related forms

Names.—Cougar; Puma; Mountain Lion; Panther; Painter.

General Description.—Largest of the New World unspotted Cats; head proportionally rather small; body long and lithe; tail long and cylindrical; five toes on forefeet, four on hind feet, each with a long, sharp, retractile claw; gait digitigrade; ears well developed, not tufted; pelage soft and rather short; color brownish. Plate XV.

Color.—Sexes colored alike; no marked seasonal variation.

Upperparts dull yellowish brown or tawny; ears blackish posteriorly and light-colored internally; tail like back, dark brown at tip; underparts paler than upperparts.

Immature yellowish brown spotted with blackish.

Measurements.—Males larger than females. Males, total length, about 96 inches; tail vertebræ, about 24–30 inches, hind foot, 10 inches; weight, about 150 pounds. Females about 12 inches shorter in total length.

Geographical Distribution.—Formerly found over practically all of North America as far north as the Great Lakes,

¹ For a preliminary revision of the Pumas see C. H., Merriam, *Proc. Wash. Acad. Sci.*, Vol. iii, pp. 577–600, 1901. This group has not been adequately revised, and the geographic ranges given in this field book are provisional.

Maine, and southern Alberta; now extinct in much of this range.

Food.—Chiefly the larger mammals when they can be found, such as Deer, Wapiti, Mountain Sheep, Antelope, and



FIG. 36. Cougar

domestic stock, but preying upon almost all of the smaller mammals, birds, and even, it is said, grasshoppers.

Enemies.—Practically none when mature.

Species and Subspecies of Cougars.

The classification of the Cougars is in a condition far from satisfactory. Many names are in more or less current usage and it is very likely that when these big Cats are revised upon the basis of large series of specimens, it will be found that all of the North American Cougars are races of the one species.

Adirondack Cougar.—*Felis cougar* Kerr.

As described above. Found in "Adirondack Mountains, New York, Green Mountains, Vermont, and until recently higher Alleghenies of Pennsylvania, Maryland, and West Virginia, where a few may still occur." (Merriam)

Florida Cougar.—*Felis coryi* Bangs.

Size large; head large; legs and feet long. Upperparts rich rusty, yellower on sides; black on ears and spot at base of

whiskers; tail dark brown, a dark streak along mid-line above, tip black; underparts buffy. Total length, 82 inches; tail vertebræ, 30 inches; hind foot, 11.2 inches. Found in Florida.

Louisiana Cougar.—*Felis arundivaga* Hollister.

Resembling *coryi* but not so reddish in color. Upperparts grayish fawn in color, sprinkled with dusky, with a pale, indefinite rufous stripe from nape to rump; blackish on face from crown to nose and on side of nose; ears blackish outside, whitish inside; pure white on lips and throat and creamy white on breast; grayish on insides of legs; tail much darker than back, with short black tip. Total length, 84 inches; tail vertebræ, 29 inches. Found in Louisiana (Concordia Parish and Morehouse Parish); limits of range unknown.

Northwestern Cougar.—*Felis oregonensis oregonensis* Rafinesque.

Upperparts reddish brown varying to grayish tawny, face, back, and tail darker; ears black on convex side; white to whitish on lips, chin, and belly; tip of tail blackish. Total length, 85 inches; tail vertebræ, 28 inches; hind foot, 10 inches. Found in Pacific coast region from Northern California north to British Columbia.

Rocky Mountain Cougar.—*Felis oregonensis hippolestes* (Merriam).

Largest of the North American Cougars; color dull, pale yellowish brown; tip of tail black; whitish on chin, lips, throat, breast, and inner sides of legs. Total length, males, 102 inches; tail vertebræ, 36 inches; hind foot, 10.6 inches; weight up to 220 pounds. Found from North Dakota, Montana, and Idaho south through Colorado and Utah to New Mexico; reported from as far north as the Athabaska River, Alberta.

California Cougar.—*Felis oregonensis californica* (May).

Differing from typical *oregonensis* in slightly paler color and more restricted dark markings, as well as in cranial characters. Total length, 78 inches; tail vertebræ, 30 inches; hind foot, 11 inches. Found in California, throughout most of the state, east to the desert areas and the Great Basin district; limits of range unknown.

Mexican Cougar.—*Felis oregonensis azteca* (Merriam).

Smaller than *hippolestes* and colored like it, dull fulvous, "but tail darker, browner, with longer black tip and no white underneath . . . ; ears almost wholly black." (Merriam) Total length, 90 inches; tail vertebræ, 29 inches; hind foot, 11 inches. Ranges from Mexico up into western Texas; limits of range unknown.

Yuma Cougar.—*Felis oregonensis browni* (Merriam).

Paler and grayer than typical *oregonensis*; smaller than *hippolestes*. Total length, 88 inches; tail vertebræ, 28

inches; weight, 170 pounds. Found along the lower Colorado River, Arizona, limits of range unknown.

* * * * *

The Cougar or Puma is one of the most difficult of wild mammals to see under normal circumstances. Men have spent years in regions where the tracks of these Cats showed the animals to be fairly common and yet have not seen the beast itself. The Cougar has been given rather a fearsome reputation in literature, and as the "Catamount" or "Painter" has figured in more than one thrilling tale. In eastern North America especially, it seems to have been a greatly feared animal; in the West the ranchers and settlers have regarded it very much the same way as they have the Wolves and Bears, that is, as harmless unless cornered.

The Mountain Lion is capable of killing an unarmed person without risk to itself, but is normally very much afraid of man and anxious to avoid him. When wounded, defending young, or driven to bay, this mammal must be respected, and there are authentic cases of unprovoked, fatal attacks upon children, but they are very rare.

The Cougar is a widely distributed mammal and prefers country where there is plenty of cover such as patches of forest, thickets of brush, or the broken topography of canyons and ravines. It hunts Deer by preference and where the larger mammals are wanting the Cougar is absent. It is a wide-ranging hunter and individuals may cover an area in a radius of thirty to fifty miles from the home den. The Cougar is a highly specialized killer and preys upon most of the mammals about him, aside from Porcupine, Skunk, and the large carnivores. He is especially destructive to the Deer and kills numbers of White-tail Deer, Mule Deer, and Wapiti. He has a habit of covering a kill with brush and returning to it for a second or third meal. He probably is most active after sundown, but sometimes moves about during the day as well.

The Cougar has many of the attributes of the small Housecat and, like it, is said to be exceedingly playful. The scream of the Cougar is a long, drawn-out cry, weird and startling, well calculated to raise the hair of the timid. The observations of many naturalists indicate that this animal has a variety of screams, cater-waulings, and yells, some of which are terrific.

The Cougar is active throughout the year and does not den up in the winter. The home den is usually in a cave or fissure in the rocks, but, if these are not available, it may be in dense vegetation. The young are usually two in a litter, but the number varies from one to five. They are generally born in late winter or early spring, but may be born in any month of the year.

Jaguar.—*Felis hernandesii* (Gray)

Names.—Jaguar; Tiger; American Leopard. Plate XV.

General Description.—Largest of the North American Felidæ; color pattern spotted. Head and body much heavier and stronger than in the Cougar; limbs comparatively short and powerful; tail of moderate length, thick.

Color.—Sexes colored alike; individual variation very great.

General pattern of upperparts a ground color of rich buffy yellow or tawny marked with black spots or rosettes; underparts whitish spotted with black; spots of varying sizes and in some places, the back, chest, and legs, they fuse to form short bars; rosettes along back and sides formed of rings which generally enclose one or more small spots; tail heavily marked with black, especially near tip.

Measurements.—Males larger than females. Males, total length, 79 inches; tail vertebræ, 21 inches; hind foot, 10 inches; height at shoulder, 28 inches; weight about 200 pounds.

Geographical Distribution.—Found only in extreme southern and southwestern states, Texas, New Mexico, and Arizona.

Food.—Large and small mammals, Deer, Peccary, domestic stock, wild Turkeys, and smaller game as it is encountered.

Enemies.—None.

* * * * * * *

Only the one variety of Jaguar is found north of the Rio Grande. To the south this big, spotted Cat has a continuous range to almost the southern end of South America.

The Jaguar is so like the Old World Leopard in general appearance that it is difficult to distinguish between skins of the two animals. The presence of black spots inside the rosettes usually marks the Jaguar, which is also a more powerful beast, more heavily built, than the Leopard, and has a shorter tail. The Jaguar which reaches the United States is

smaller than most of the southern Jaguars and much smaller than the big Jaguar of southern Brazil.

The Jaguar is a formidable beast of prey, quite capable of carrying off a man, although the northern variety does not seem to be aggressive and the only records of attack upon man show provocation. Like most of the Cat family, this animal is secretive and wary in habits and is seldom seen. It travels long distances in search of prey and the fact that it has been reported as far north as central California and Colorado would indicate that it may roam far from its usual haunts.

This Cat is a jungle dweller and prefers dense thickets and heavy growths of vegetation. It climbs trees upon occasion, but is probably not so given to this as the Cougar. The call of the Jaguar is a hoarse cough or short roar suggestive of great strength and power, made up of a repetition of guttural notes, recorded as "uh, uh, uh, uh."

The young are born in April or May and number from two to four. The cubs are more heavily spotted than the adults and their coat is woollier.

Ocelot.—*Felis pardalis griffithii* (Fischer)

Names.—Ocelot; Tiger-cat; Leopard-cat. Plate XVI.

General Description.—A medium-sized, spotted or marbled Cat, with a fairly long tail. Head and body like a large, overgrown House-cat; limbs fairly long; tail slightly less than half as long as body; pelage short and close; color pattern gray and buff marked with much black.

Color.—Sexes colored alike; no marked seasonal variation but a wide range of individual variation.

Upperparts buffy to gray, heavily spotted and marked with small rings, blotches, and short bars; underparts white spotted with black; tail spotted and ringed with black; black markings along back and sides, usually arranged as broken lines or chains.

Immature generally with more black than adults.

Measurements.—Males larger than females. Total length, males, 50 inches; females, 40 inches; tail vertebræ, males, 15 inches, females, 13 inches; hind foot, males, 5.5 inches, females, 5 inches; weight about 25–35 pounds.

Geographical Distribution.—Of southern distribution and crossing into the United States only in southwestern Texas.

Food.—Small mammals, birds, and reptiles.

Enemies.—Probably very few because of its ability to escape.

* * * * * *

Like the Jaguar, only the one species of Ocelot is known to occur north of the Rio Grande. In Central and South America the Ocelots are a large and widely distributed group.

"In the lower Rio Grande Valley of Texas the tiger-cat is rather common, with the eyra-cat, in areas densely overgrown with thorny chaparral. Like most of the cat tribe, it is strictly nocturnal and by day lies well hidden in its brushy shelter. By night it wanders along trails over a considerable territory, seeking its prey. Birds of all kinds, including domestic poultry, are captured on their roosts, and rabbits, wood rats, and mice of many kinds, as well as snakes and other reptiles, are on its list of game.

"The tiger-cat is much more quiet and less fierce in disposition than most felines. . . .

"The tiger-cat brings within our fauna an interesting touch of the tropics and its exuberance of animal life. It is found in so small a corner of our territory, however, that, despite its mainly inoffensive habits, it is certain to be crowded out in the near future by the increased occupation of its haunts." (Nelson, *Wild Animals of North America*, p. 416.)

The scanty records on breeding habits of the Ocelot indicate but two young to a litter, and the date of birth September or October.

Jaguarundi.—*Felis cacomitli* Berlandier

Names.—Jaguarundi; Cacomitl Cat; Eyra (in red phase); Red and Gray Cat. Plate XVI.

General Description.—A small, unspotted Cat with long, otter-like body; head comparatively small; legs short; body slender; tail long.

Color.—Occurring in two distinct color phases; some seasonal variation.

Gray phase.—Everywhere grizzled smoky gray, a mixture of black, buff and whitish to give pepper-and-salt appearance; underparts slightly paler than upperparts but no marked contrast between the two; winter pelage with more black than in summer.

Red phase.—Rather uniform rusty red sprinkled with blackish on back; head and legs not so reddish, browner; whitish usually on lips and throat.

Measurements.—Males somewhat larger than females. Total length, about 42 inches; tail vertebrae, 20 inches; hind foot, 5.5 inches.

Geographical Distribution.—Southern in distribution and reaching the United States only in extreme southern Texas.

Food.—Small mammals, birds, and possibly some aquatic life such as fish, frogs, etc.

Enemies.—Probably very few because of ability to escape the larger carnivores.

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Only one species of this group of Cats reaches the United States, but to the southward the Jaguarundis are found throughout Central America and a large part of South America.

Bailey, in his *Biological Survey of Texas*, North American Fauna, No. 25, p. 168, quoting a letter from F. B. Armstrong, writes:

"Eyra and yaguarundi cats inhabit the densest thickets where the timber (mesquite) is not very high, but the underbrush—catsclaw and granjeno—is very thick and impenetrable for any large-sized animal. Their food is mice, rats, birds, and rabbits. Their slender bodies and agile movements enable them to capture their prey in the thickest of places. They climb trees, as I have shot them out of trees at night by 'shining their eyes' while deer hunting. I captured them by burying traps at intervals along the trails that run through these thick places. I don't think they have any regular time for breeding, as I have seen young in both summer and winter, born probably in August and March. They move around a good deal in daytime, as I have often seen them come down to a pond to drink at midday, and often see them dart through the brush in daytime. They are exceedingly hard to tame. Their habitat is from the Rio Grande, 40 miles north of here (Brownsville), as far as Tampico, Mexico. Beyond that I don't know."

Genus *Lynx*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{2}{2}$; Molars, $\frac{1}{1}$ = 28.

Lynx.—*Lynx canadensis*

and related forms

Names.—Lynx; Bobcat; Wildcat; Loup-cervier (French Canadian). Plates XVII and XIX.

General Description.—A good-sized Cat with prominent, tufted ears; very short tail; long limbs; large, broad feet; and rather long, loose pelage.

Color.—Sexes colored alike; marked seasonal variation and considerable individual variation.

Upperparts.—Grizzled gray, brown, and blackish; the pelage pale drab at base, then buffy brown and finally tipped with



FIG. 37. Lynx

light gray, dark brown, or blackish; nose and cheeks grayish; crown brownish; ears inside grayish white, edged with buff, a gray spot on posterior surface; apex of ear, tuft, and lines down margin of ear black; ruff about throat, mixed blackish, dark brown, and gray; tail brownish, tipped with black; sides and limbs lighter and warmer in tone than back.

Underparts.—Mixed grayish and light buffy brown, with occasional irregular blotches of blackish.

The above is for November skins in fresh pelage; summer pelage is browner and when worn and ragged, as in late

summer, most of the colored tips of the hairs are missing and the buffy basal pelage predominates.

Immature spotted and streaked with brown and blackish upon a light fawn ground color.

Measurements.—Males larger than females. Total length of males, 36–39 inches; tail vertebræ, 4 inches; hind foot, 9.5 inches; weight, 20–25 pounds, a recorded maximum weight of 44 pounds.

Geographical Distribution.—Boreal North America, south in the eastern part of the Great Lakes district and to Pennsylvania and in the west to Colorado (New Mexico?) and Oregon (*canadensis* group).

Food.—Small mammals, birds, sometimes snakes and frogs; principally Rabbits, Squirrels, Mice, Partridges; known to kill Foxes.

Enemies.—Probably able to escape, under normal circumstances, from the few large carnivores capable of preying upon it.

Species and Subspecies of the Genus **Lynx**.

Canadensis Group

Canada Lynx.—*Lynx canadensis canadensis* Kerr. Plate XIX. As described. Found in eastern Canada and northeastern United States south to Pennsylvania, west to the Pacific Ocean, north to the limit of trees, and south into Oregon and Colorado in the mountains.

Arctic Lynx.—*Lynx canadensis mollipilosus* Stone.

“Browner and less gray than true *Lynx canadensis*, with a very dense, soft, woolly pelage.” (Stone—for November specimen) Total length, males, 41 inches; tail vertebræ, 5.2 inches; hind foot, 10.4 inches. Found from Point Barrow, Alaska, south to British Columbia.

Newfoundland Lynx.—*Lynx subsolanus* Bangs.

Resembling *canadensis* in size and general color pattern, but darker and richer in tone. Upperparts (summer) mixed black and hazel. Found in Newfoundland.

Rufus Group

Bay Lynx; Wildcat; Bobcat.—*Lynx rufus rufus* (Schreber).

Like *Lynx canadensis* in general appearance but feet much smaller, ears but slightly or not at all tufted, tail not black all around at tip; pelage brownish and spotted instead of pale grizzled gray; hair not as long. Upperparts variable

but usually mixed buff and brown spotted and lined with black or brownish black, darkest along dorsal region; sides of legs lighter and buffier; crown streaked with black; ear marked heavily with black on posterior side, with large gray spot; black tuft on ear small; tail above like back, tipped with black, below like belly and without black tip; underparts whitish, washed with buffy on neck, and heavily spotted with black; ruff on chin small. Paler in winter than in summer. Total length, 36 inches; tail vertebræ, 7 inches; hind foot, 7 inches. Found in eastern United States from Maine to southern Georgia and west to North Dakota. Plates XVII and XIX.

Florida Bobcat.—*Lynx rufus floridanus* (Rafinesque).

Darker than typical *rufus* and more lightly built in proportion to its size; feet smaller; upperparts with heavy mixture of black and lacking the reddish brown tinge of typical *rufus*. Total length, 39 inches; tail vertebræ, 7 inches; hind foot, 7.5 inches; weight, 17.5 pounds (male, not fat). Found in Florida, north to Georgia, west to Louisiana.

Texas Bobcat.—*Lynx rufus texensis* (Allen).

Rather richer in color than typical *rufus*, heavily spotted. Upperparts (Brownsville specimen) rich tawny rufous without any blackish along dorsal area; underparts thickly spotted. Found in southern and eastern Texas.

California Bobcat.—*Lynx rufus californicus* Mearns.

Browner and less spotted than *texensis*. Reddish brown above heavily mixed with gray and blackish, darkest along dorsal area; sides and limbs rich buffy; broad collar of pale rusty gray spotted with black. Total length, males, 34 inches; females, 32 inches; tail vertebræ, males, 6.8 inches, females, 6 inches; hind foot, males, 6.7 inches, females, 6.4 inches. Found throughout most of California west of the desert areas and east of the northern coast belt, reaching to coast throughout southern three-quarters of the state.

Lynx fasciatus oculus Bangs = *Lynx rufus californicus*, according to Grinnell and Dixon.

Desert Bobcat.—*Lynx rufus eremicus* Mearns.

Upperparts pale yellowish brown grizzled with gray and black, lightly spotted and striped with brown to blackish; underparts white; tail with about seven transverse black bars on upperside; other details of coloration about as in typical *rufus*, but paler in tone. Total length, 37 inches; tail vertebræ, 7 inches; hind foot, 7.5 inches. Found in the desert areas of California from the Needles in the north and San Bernardino County in the west, south into Arizona.

Mountain Bobcat.—*Lynx uinta* Merriam.

Largest of the *rufus* group, hind foot very large; tail very long and with two black bands on upper surface in front of black tip. Upperparts mixed buffy, gray, and black, without distinct spotting or markings; underparts white

spotted with black; pale yellowish brown on throat. Total length, 41 inches; tail vertebræ, 7.8 inches; hind foot, 8 inches; weight 31 pounds (male, not fat). Found in the mountains of Wyoming, Colorado, Utah, and New Mexico.

Bailey Bobcat; Plateau Bobcat.—*Lynx baileyi* Merriam.

Color pattern made up of soft grays and buffy browns somewhat suggestive of Canada Lynx; summer pelage sometimes with strong rufous tinge; winter pelage grayer; tail with one blackish and one fulvous dorsal band in front of black tip. Total length, males, 36 inches; females, 34 inches; tail vertebræ, males, 7.2 inches, females, 6.8 inches; hind foot, males, 7.6 inches, females, 7 inches. Found in the southern half of California (eastern portions), Arizona and New Mexico, north into Colorado, and east into Texas and Oklahoma.

Barred Bobcat.—*Lynx fasciatus fasciatus* Rafinesque.

A richly colored Wildcat; upperparts chestnut-brown to rusty, with grizzling of black on dorsal area; legs barred with dark brown and blackish; sides paler than back; underparts white, heavily marked with black, terminal third of tail black. Total length, males, 34.5 inches, females, 32 inches; tail vertebræ, males, 6.8 inches, females, 6.5 inches; hind foot, males, 6.8 inches, females, 6.6 inches. Found in northwestern (coastal) California, in Oregon, Washington, and southwestern British Columbia; in humid coastal strip throughout.

Pallid Barred Bobcat.—*Lynx fasciatus pallescens* Merriam.

Smaller and paler than typical *fasciatus*, especially on head and face; black on ear restricted and gray patch large (winter); general color hoary gray. Total length, females, 32 inches; tail vertebræ, 5.6 inches; hind foot, 6 inches. Found in "Northeastern California (in Lassen, Modoc, and eastern Siskiyou counties) east across northern Nevada and northern Utah to Colorado; also north through eastern Oregon and eastern Washington, and thence east through Idaho into Wyoming and perhaps farther." (Grinnell and Dixon)

Nova Scotia Bobcat.—*Lynx gigas* Bangs.

"Very stout and powerfully built; size very large; colors rich with much black on upperparts; triangular spot of gray on ear very small; skull large and strong." (Bangs) Upperparts (winter) mixed cinnamon, gray and blackish; tail above, dull cinnamon tipped with black; below, whitish, throat patch dull cinnamon; soles of feet blackish. Total length, males, 40 inches; tail vertebræ, 7 inches; hind foot, 8 inches. Found in Nova Scotia; limits of range unknown.

* * * * * * *

The Lynx is in many respects a big, overgrown House-cat, with greater potentialities for killing its prey. It is unlike

LYNX AND BOBCAT

the Common Cat in its long legs, big feet, and short tail, and in some of its traits, such as a willingness to take to water.

The Lynx is a forest creature and prefers the cover of heavy woods. It is a wary animal and difficult to observe, mainly nocturnal in habit but occasionally about by day. Its chief prey is Hares and Rabbits, although it may extend its foraging to take in Foxes, young or even adult Deer, and Mountain Sheep. In winter the broad feet enable the Lynx to stay on top of the snow when most of the other mammals are breaking through and at a disadvantage. Like all of the other Cats this animal has no dormant period in the winter, but is active the year around.

The Lynx has several calls all more or less like those made by a House-cat but magnified. It mews, yowls in search of a mate, and cater-wauls and howls when two are together.

The Lynx has from one to four young in a litter and they are born from March to June, depending upon the locality. The nest is located in a hollow log or hole in the rocks.

The Bobcat does not differ greatly from the Lynx in habits except where it has become a dweller on the arid desert tracts of the Southwest. In such places the different nature of the environment has caused some modification of behavior. The Bobcat is more southern in its distribution than the Lynx. There is some overlapping in range, but the Bobcat is essentially a Cat of the warmer regions while the Lynx prefers the cold to Arctic areas. The Bobcat has learned to live in settled districts and does not resent the inroads of civilization as does the Lynx.

The Bobcat is shy and furtive in its behavior and very seldom seen. It makes full use of every bit of cover and is most active at night. It is an able hunter and takes toll of all the small game of its district and even kills animals the size of Sheep and Deer. In the Southwest the Bobcat does a service to the ranchman in keeping down the numbers of Rabbits and small rodents.

The Bobcat has from two to four young and they are born in April or May.

Order PINNIPEDIA. SEALS and WALRUSES

Large mammals highly modified for an aquatic habitat, but spending part of their existence on the seashore.

Limbs fin-like, with loss of the normal terrestrial function; toes fully webbed for swimming, first toe of forefoot and first and fifth toes of hind foot longest; body prostrate in posture; tail reduced and rudimentary; ears greatly reduced or absent; eyes large, cornea flat; teeth always present, dentition often highly specialized; hair varying with genera from coarse bristles to the finest fur.

Family Otariidæ. Eared Seals, Sea-lions and Fur Seals

Active Seals with hind limbs capable of rotation forward; forelimbs nearly as long as hind limbs; neck long; first and fifth toes of hind foot lacking claws; webs of feet extending beyond toes; small external ears present; upper incisors notched; males larger than females; pelage with or without underfur.

The members of this family are much more active on land than the Hair Seals. The family includes the species having the greatest commercial value, the Fur Seals, and the commonest of the large Seals, the Sea-lions.

Genus *Zalophus*

Dentition.—Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 34.

California Sea-lion.—*Zalophus californianus*

General Description.—Size very large, males much larger than females; no underfur; body form rather slender and graceful compared with the Hair Seals; males much thicker through shoulders than females and with a prominent, longitudinal crest from between eyes to occiput.

SEA-LION

Color.—Sexes colored very much the same: pelage moderately coarse, but sleek and shining when wet.

Yellowish brown above and below, varying sometimes through darker shades to dull black.

Measurements.—Average male: Total length, 98 inches; hind flippers, tip to tip outstretched, 37 inches; estimated



FIG. 38. California Sea-lion

weight, 500 pounds. Individuals may exceed this; an old male in the New York Aquarium was weighed by Dr. C. H. Townsend and found to scale 620 pounds.

Geographical Distribution.—Pacific coast of North America.

Food.—Fish of many species, crustaceans and squid.

Enemies.—Killer Whales.

Species of Sea-Lions

Genus *Zalophus*

California Sea-lion.—*Zalophus californianus* (Lesson).

As described above. Found along Pacific coast from southern Mexico to northern California.

Genus **Eumetopias**

Steller Sea-lion; Northern Sea-lion.—*Eumetopias jubatus* (Schreber).

Externally very much like *Zalophus californianus* but larger in size and distinguished by dental characters such as a noticeable space between molar and premolars; occipital crest of males not greatly developed. Color yellowish brown to dark brown. Estimated weight of average male, 1500-1800 pounds. Found from Bering Straits south to Farallon Islands, California.

* * * * *

Sea-lions are the commonest Seals along the Pacific Coast. Along the shores of California, Oregon, Washington, and British Columbia they outnumber the other pinnipeds, and on the score of size and color are easily distinguished from the other Seals.

The California Sea-lion is a common sight off the rocks and beaches of California, while farther north this genus is replaced by the Steller Sea-lion which is also abundant and easily noted. Where Sea-lions are not molested they are rather trusting and unsuspicious in the water, loafing on the surface within stone's throw of man or swimming quite close if one remains motionless. They are not so trusting when drawn out on the shore and usually make for the water at the first sign of danger.

Sea-lions have but a single pup at a birth.

Genus **Callorhinus**

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ or $\frac{2}{2}$ = 34 or 36.

Alaska Fur Seal.—*Callorhinus alascanus* Jordan and Clark

Names.—Alaska Fur Seal; Northern Fur Seal; Sea-bear.

General Description.—Seals of medium size with abundant, soft underfur; rostrum short, wide, convex in profile; occipital crest not greatly developed; males much larger than females. Pelage composed of dense, soft underfur, hidden by longer, coarser hairs; underfur light yellowish brown.

Color.—Sexes differently colored.

Male.—Upperparts black, gray over shoulders and front of neck, brownish on face; flippers reddish brown; underparts reddish brown.

Female.—Upperparts gray; underparts rufous.

Immature.—Glossy black above, washed with yellowish brown below.

Measurements.—Males much larger than females. Total length, males, 75 inches, females, 50 inches; tail vertebræ, males, 2 inches, females, 1.5 inches; hind foot, males, 21 inches, females, 16 inches; weight, males, 300–500 pounds.

Geographical Distribution.—Pribilof Islands and other localities in Bering Sea south to shores of California, in winter.

Food.—Fish and squid.

Enemies.—Killer Whales.

* * * * * * *

So much has been written on the life-history of the Fur Seal that there is quite an extended literature on the subject. A few of the most comprehensive and easily obtainable sources are listed at the close of this handbook.

Although Fur Seals swing far south of Alaska in winter, they stay offshore and are not often seen. During the breeding season, May to November, they are congregated on the Pribilof Islands in large rookeries. The official government report of 1926 gave the census of the Fur Seals on the Pribilof Islands as 761,281. Fur Seals bear one pup, the baby Seal arriving from June 20 to July 20.

The Alaska Fur Seal of commerce is the plucked, dressed, and dyed pelt during which process the long, hard guard-hairs are removed to expose the soft, dense underfur. Although a large number of these Seals are killed each year, under government supervision, their fur is not as popular as it has been in former years. Hudson Seal (dressed Muskrat) has been a large factor in driving it from popular favor, and there are many other cheaper furs which have come to take its place.

Family **Phocidæ**. Hair Seals or Earless Seals

Hind legs incapable of rotation forward, poorly suited for progression on land; forelimbs smaller than hind limbs; neck short; external ear absent; upper incisors pointed; pelage without underfur. This family includes the commonest small Seals of temperate waters, the Harbor Seals.

Genus *Phoca*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 34.

Harbor Seal.—*Phoca vitulina concolor*

and related forms

Names.—Harbor Seal; Hair Seal; Leopard Seal; Common Seal.

General Description.—A small Seal with short limbs and pelage rather coarse and hairy. Head and body typically seal-like; color variable.



FIG. 39. Harbor Seal

Color.—Sexes colored alike; varying from yellowish gray spotted with dark brown to almost black spotted with yellowish; very young animals are white.

Measurements.—Sexes of equal size. Total length about 60 inches.

Geographical Distribution.—Atlantic coast from the Carolinas northward.

Food.—Fish, squid, crustaceans, etc.

Enemies.—Killer Whale; Sharks; Polar Bear.

RIBBON SEAL

Species and Subspecies of the Genus **Phoca**

Subgenus **Phoca**

Atlantic Harbor Seal.—*Phoca vitulina concolor* (DeKay).

As described. Found from the Carolinas north along Atlantic coast into the Arctic Ocean.

Pacific Harbor Seal.—*Phoca richardii richardii* (Gray).

Resembling the Atlantic Harbor Seal but characterized by slightly different skull characters. Found on Pacific coast from Oregon north to the Pribilof Islands of Alaska.

Pribilof Harbor Seal.—*Phoca richardii pribilofensis* Allen.

Differing from typical *richardii* in having weaker dentition. Found about the Pribilof Islands.

California Harbor Seal.—*Phoca richardii geronimensis* Allen.

Larger than typical *richardii* and with heavier dentition. Found along coast from Oregon south into Mexico.

* * * * *

The Harbor Seal is the common, small Seal found in suitable localities along either coast. In addition to the character of small size, the spotted color pattern is an aid in identification.

This Seal takes its name from its preference for the coast-line, being found about bays, harbors, mouths of rivers, and sand-bars. It does not go far from land nor migrate like some of the other Seals. It may be seen in small herds, but never in large rookeries. The young are born in early Spring.

Subgenus **Histriophoca**

Ribbon Seal.—*Phoca fasciata* Zimmerman

About the size of the Harbor Seal and like it in external build, but color pattern quite different. Pelage brown marked



FIG. 40. Ribbon Seal

with strongly contrasted and clearly outlined bands of yellow to ochraceous yellow about neck, shoulder, and rump; sometimes rings are confluent; females less conspicuously marked than males and having only obscure bands. This is not a common Seal and is found sparingly about the Aleutian Islands and coast of Alaska.

Subgenus *Pusa*

Ringed Seal.—*Phoca hispida* Schreber

A medium-sized Seal quite like the Harbor Seal in general appearance but colored differently and with different cranial characters. First digit of fore-flipper longer than any of the others. Upperparts dark brownish to blackish brown faintly marked with small, irregular rings or blotches of yellowish; underparts yellowish to strong ochraceous yellow. Circumpolar in distribution, south to Labrador on Atlantic coast, to Bering Sea on Pacific coast.

Subgenus *Pagophilus*

Greenland Seal; Harp Seal; Saddle-back Seal.— *Phoca grœnlandica* Erxleben

Somewhat larger than the Harbor Seal—length up to 72 inches, weight 600–800 pounds for old males, females a quarter smaller—pelage of male bright yellowish, marked with a broad band of brown along side which crosses over shoulders to meet its fellow from the other side; these bands may also meet across lower back; dark brown on head and spots on hind limbs. Females not so clearly marked with brown or lacking brown completely. Young white. Found in circumpolar seas, south to Gulf of St. Lawrence.

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The Harp Seal is much hunted for its oil, and with the Hooded Seal forms the major part of the Seal catch of the Newfoundland Seal fisheries. This Seal has a regular period of migration and moves south when ice begins to close the northern feeding grounds. About the end of September the Harp Seal starts south and passes for upwards of nine hundred miles to reach the Straits of Belle Isle where the stream of

animals fans out, some to work westward into the Gulf, others to continue south along the eastern coast of Newfoundland.

Early in February the Seals begin the northern movement, and in March the young are born either off the Straits of Belle Isle or in the Gulf of St. Lawrence. The young are left on drifting ice-pans, generally not over a few inches in thickness. The old Seals make holes through the ice-sheets by which to come and go. Captain Robert A. Bartlett gives the numbers of Seals in the two main herds as 300,000 in the Gulf of St. Lawrence and 500,000 off Belle Isle, and comments on the ability of the old Seals to find their young after a day's absence when the drift has shifted the ice for several miles. But one young is born to a mother; twins are rare.

After the young Seals are able to leave the ice and take to the water, the families move north, eventually to the coast of Greenland.

Bartlett gives the speed of the Seal as twenty miles per hour for a limited period, and estimates the time it can remain under water as about twenty minutes. This animal is known to eat fish which occur at a depth of about two hundred feet.

Genus *Erignathus*

Dentition: Same as for *Phoca*; proportionally weak.

Bearded Seal.—*Erignathus barbatus*

and related forms

General Description.—A large, plain-colored Seal, much larger than the Harbor Seal, reaching a length of 10 to 12 feet. Color everywhere grayish to yellowish (considerable individual variation), darkest along back; a prominent tuft of long, flattened bristles on each side of muzzle which gives animal a "bearded" appearance.

Geographical Distribution.—Found in polar seas south to Newfoundland.

Species and Subspecies of the Genus *Erignathus*.

Atlantic Bearded Seal.—*Erignathus barbatus barbatus* (Erxleben).

As described above. Found along northeastern North America from Newfoundland north.

Pacific Bearded Seal.—*Erignathus barbatus nauticus* (Pallas). Very much like typical *barbatus*; differing in cranial characters, such as short nasals, wider braincase, etc. Found from coast of Alaska eastward.

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The Bearded Seal is an Arctic species and is found only in the northern seas. It hauls out on the ice but does not break holes in the ice-sheets for this purpose, choosing instead to take advantage of natural fissures or openings. It is much hunted by the Eskimos.

Genus *Halichærus*

Dentition: Incisors, $\frac{3}{2}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 34.

Gray Seal.—*Halichærus grypus* (Fabricius)

General Description.—A very large Seal of plain color pattern. Color varying with the individual from silver or ashy gray to dusky gray, obscure blackish spots on upperparts and sides. Length up to 10 or 12 feet.

Geographical Distribution.—Found along Atlantic coast from Nova Scotia to Greenland.

The Gray Seal prefers rocky localities where the water is rough and ocean currents swirl in and out. The males fight amongst themselves in the breeding season and often carry scars. It is not a common Seal on the American coasts.

Genus *Cystophora*

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 30.

Hooded Seal.—*Cystophora cristata* (Erxleben)

General Description.—A fairly large Seal, dark in color, having on the top of the head (males only) an inflatable bag of muscular tissue; upperparts slaty black, sides lighter and thickly spotted with whitish; length, 84–96 inches. Young white.

Geographical Distribution.—Found from Newfoundland to Greenland and rarely as far south as New England.

* * * * *

The Hooded Seal is one of the more abundant Seals of the North Atlantic and ranges over much the same area as the

Harp Seal (see page 176). The two Seals are more or less associated in their migrations and have somewhat similar habits. The Hooded Seal chooses heavier and older ice for the whelping ground, and instead of breaking a hole through shallow sheets of ice it selects [ice-hummocks



FIG. 41. Hooded Seal

that may be approached from the open sea. This Seal does not congregate in large, continuous herds but in small, scattered groups and usually at some distance from the herds of Harp Seal.

The Hooded Seal is more wild and quarrelsome in disposition than the Harp and when angered inflates the hood on the head. The female Hooded Seal usually fights for its young and will die rather than desert it.

Young Seals, after the first year, are known as "bedlamers" in the vernacular of the sealers.

Genus *Mirounga*

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{1}{1}$; Premolars, $\frac{4}{4}$; Molars, $\frac{1}{1}$ = 30

Elephant Seal; Sea-elephant; Northern Elephant Seal.—*Mirounga angustirostris* (Gill)

General Description.—A very large Seal, the largest of the true Seals; males much larger than females and having a long proboscis of cavernous tissue capable of inflation, which is somewhat suggestive of an Elephant. Body huge and ponderous; hind limbs without nails; color brownish to slaty. Males reach maximum length of about 18 feet, females half that length.

Geographical Distribution.—Now restricted to the Island of Guadalupe, Mexico, southwest of San Diego, California,

but formerly occurring along the coast and islands of southern California as far north as Point Reyes.

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The Elephant Seal is well characterized by large size and long, pendulous nose (in the case of males). This huge Seal is



FIG. 42. Head of Elephant Seal

represented by two distinct forms, the Antarctic or Southern Elephant Seal, and the Northern Elephant Seal, the latter faced with extinction today. Although formerly known from many localities along the coast and islands of Lower California and southern California, it has been so hunted for its oil that it is now extinct north of Mexican territory. The only known herd, of several hundred individuals, is on Guadalupe Island southwest of San Diego, California.

Family Odobenidæ. Walruses

Seal-like, marine mammals of very large size, having greatly elongated upper canines.

Genus *Odobenus*

Dentition: { Young, Incisors, $\frac{2}{2}$; Canines, $\frac{1}{1}$; Premolars and
 Molars, $\frac{5}{4} = 30$
 Adult, Incisors, $\frac{1}{1}$; Canines, $\frac{1}{1}$; Premolars, $\frac{8}{8}$;
 Molars, $\frac{8}{8} = 18$

Walrus.—*Odobenus rosmarus*

and related species

General Description.—A very large, seal-like mammal with hairless (almost), wrinkled skin and large, tusk-like upper canines. Head proportionally small; muzzle blunt and broad, set with coarse bristles; body gross and ponderous;



FIG. 43. Walrus

neck massive; fore-flippers with five toes bearing flat nails; hind flippers with fifth toe longest, nails on all five toes but those on first and fifth flat, others long and pointed; tail vestigial; skin very thick and rugose.

Color.—Sexes colored alike; yellowish brown everywhere except for reddish brown on base of flippers and on underparts.

Measurements.—Males about a third larger than females; males 10 to 11 feet in length, weighing from 2000 to 3000 pounds.

Geographical Distribution.—Arctic Seas.

Food.—Principally molluscs, bivalves, starfish, and shrimp.

Enemies.—Polar Bear and Killer Whale.

Species of the Genus *Odobenus*

Atlantic Walrus; Morse; Sea-horse.—*Odobenus rosmarus* (Linnæus).

As described. Found in the North Atlantic and adjacent Arctic seas south to coast of Labrador.

Pacific Walrus.—*Odobenus divergens* (Illiger).

Resembling the Atlantic Walrus but with longer, heavier and more divergent tusks. Found in Bering Sea north into Arctic Ocean.

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The Walrus is so well characterized by its tusks and huge size that it will not be confused with any of the marine mammals. It is not encountered out of northern seas and one must go on a special expedition to encounter Walrus.

These mammals make a fierce and imposing appearance and hunting them is said to be attended with some element of risk. However, the Eskimos kill them from fragile skin boats, and against modern equipment and firearms the odds are overwhelmingly against the Walrus.



Order RODENTIA. RODENTS (exclusive of Hares, Rabbits, and Pikas)

Placental mammals of very small to medium size; non-volant, terrestrial, semiaquatic, fossorial or arboreal in habit; feet with claws; dentition adapted for cutting and grinding vegetable substances; incisors one in each jaw (two above, two below), prominent, more or less protruding, growing from a persistent pulp; a wide diastema or space (no canine teeth) between incisors and molar teeth which have relatively flat crowns; lower jaw capable of more or less longitudinal movement; clavicle present but sometimes reduced; form various.

Family **Sciuridæ**. Squirrels

Form varying from slender to robust; size small to fairly large; head rounded; tail without scales, short to long, usually flattened, well haired; cheek-teeth at least four on each side; molars rooted, tubercular; ribs twelve to thirteen pairs; clavicles developed; habit terrestrial, fossorial, or arboreal.

Subfamily **Sciurinae**

Genus **Marmota**¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{8}{8}$ = 22.

Woodchuck.—Marmota monax

and related forms

Names.—Woodchuck; Marmot; Ground-hog; "Siffleur" (French Canadian). Plate XX.

General Description.—A large, terrestrial Squirrel with heavy-set body and short tail. Head broad and short; nose blunt; ears low, rounded; eyes small; tail well haired, flattened;

¹ For a full review of the genus *Marmota* see A. H. Howell, *North American Fauna*, No. 37, 1915.

claws strong and adapted for digging; thumb small, rudimentary, with flat nail; pelage long, coarse, with shorter, softer underfur. Color above, brownish or yellowish. Living in burrows in the ground or in piles of rock.

Color.—Sexes colored alike.

Upperparts.—Brownish, with grayish or reddish wash, having a grizzled appearance because of intermixture of whitish, buffy, or cinnamon-colored hairs; underfur dark gray



FIG. 44. Woodchuck

at base, but tipped with ochraceous or cinnamon; longer hair parti-colored, brownish tipped with light buff to white; head darker, Vandyke-brown; whitish or buffy areas on sides of face, nose, lips, and chin; forelegs and feet black to dark brown; hind legs tawny; tail from black to dark brown.

Underparts.—Varying from buffy whitish to tawny or brownish, the bases of the hairs being blackish brown.

Young.—Colors not as rich as in adults.

Measurements.—Males larger than females. Males: total length, 26–27 inches; tail vertebræ, 6 inches; hind foot, 3.5

inches. Females: total length, 22 inches; tail vertebræ, 5-6 inches; hind foot, 3 inches.

Geographical Distribution.—Most of North America from 35° in the south to 55° in the north, in the west as far north as Alaska.

Food.—Vegetation of various kinds, grass, clover, crops, foliage of native species.

Enemies.—Eagles, large Hawks, Foxes, Wildcats, Mountain Lions, Coyotes, Wolves, Wolverines, Bears.

Species and Subspecies of the Genus *Marmota*

Monax Group

Southern Woodchuck.—*Marmota monax monax* (Linnæus).

As described above. Found in "Middle eastern United States from Pennsylvania, New Jersey (?), Ohio, Indiana, Illinois, and Iowa, south to the northern parts of South Carolina, Georgia, Alabama, and Arkansas; west to eastern Kansas." (Howell)

Rufescent Woodchuck.—*Marmota monax rufescens* Howell.

Resembling typical *monax* but redder above and below. Found in "Eastern North Dakota, central and southern Minnesota, Wisconsin, and Michigan, southern Ontario, greater part of New York (including Long Island), and higher parts of western Massachusetts." (Howell)

New England Woodchuck.—*Marmota monax preblorum* Howell.

Intermediate in color between typical *monax* and *rufescens*, smaller than either. Total length, 20 inches. Found in "Southern New England, from Connecticut to central Vermont and New Hampshire and southern Maine." (Howell)

Labrador Woodchuck.—*Marmota monax ignava* (Bangs).

Larger than *preblorum*; total length, 21-22 inches; color resembling that of *rufescens*, skull with very broad nasals. "Known only from vicinity of type locality [Black Bay, Straits of Belle Isle, Labrador]; probably north to Hamilton Inlet." (Howell)

Canada Woodchuck.—*Marmota monax canadensis* (Erxleben).

Small in size, sexes approximately equal in size. Total length, 20 inches. Color strongly reddish above and below. Found in "Greater part of interior of Canada, from Great Slave Lake and York Factory south to southern Alberta (Red Deer), central Saskatchewan (Cumberland House), northern Minnesota, northern Wisconsin, northern Michigan; central Ontario, southern Quebec, New Brunswick, and Nova Scotia; northern and eastern limits of range in Quebec unknown." (Howell)

British Columbia Woodchuck.—*Marmota monax petrensis* Howell.

Resembling *canadensis* but with different cranial characters, skull larger and longer. Found in "Interior ranges of southern British Columbia and adjacent parts of United States, from Barkerville, British Columbia, south to Thompson Pass, Idaho." (Howell)

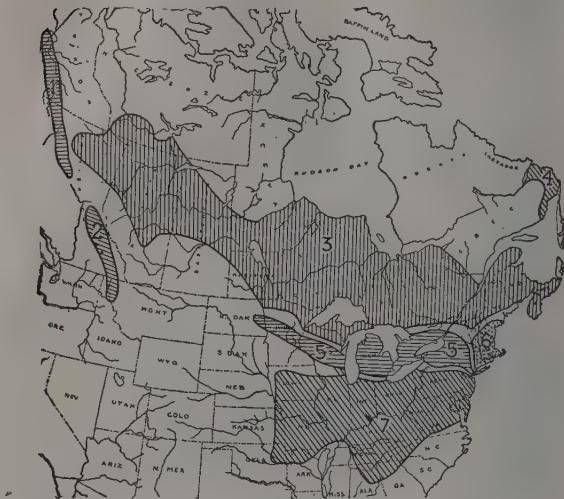


FIG. 45. Distribution of the subspecies of *Marmota monax*, after A. H. Howell

1. *Marmota monax ochracea*
2. *Marmota monax petrensis*
3. *Marmota monax canadensis*
4. *Marmota monax ignava*
5. *Marmota monax rufescens*
6. *Marmota monax preblorum*
7. *Marmota monax monax*

Ochraceous Woodchuck.—*Marmota monax ochracea* (Swarth). Resembling *canadensis* but with longer and narrower skull. Color ochraceous above, tawny to hazel below. Found in "Interior mountain ranges of Yukon and northern British Columbia, from Fortymile Creek south to the Babine Mountains (and Stuart Lake ?)." (Howell)

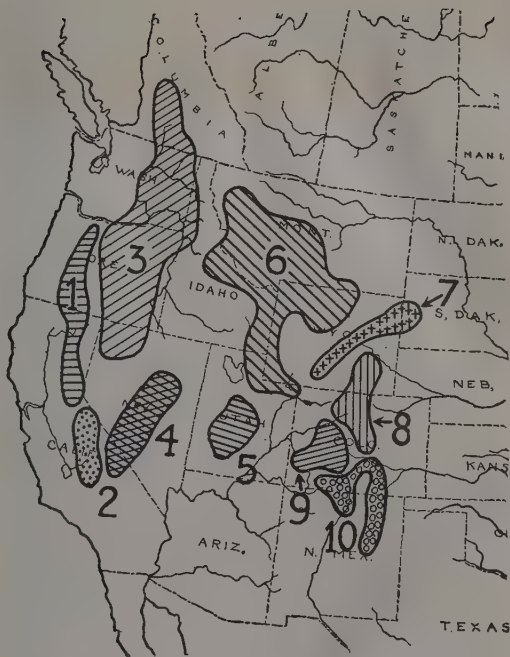


FIG. 46. Distribution of the subspecies of *Marmota flaviventris*, after A. H. Howell

1. *Marmota flaviventris flaviventris*
2. *Marmota flaviventris sierræ*
3. *Marmota flaviventris avara*
4. *Marmota flaviventris parvula*
5. *Marmota flaviventris engelhardti*
6. *Marmota flaviventris nosophora*
7. *Marmota flaviventris dacota*
8. *Marmota flaviventris luteola*
9. *Marmota flaviventris warreni*
10. *Marmota flaviventris obscura*

Flaviventris Group

Yellow-bellied Marmot.—*Marmota flaviventris flaviventris* (Audubon and Bachman).

Size large, total length, males, 28 inches, females 25 inches; tail vertebræ, males, 7 inches, females, 6.8 inches; hind foot, males, 3.6 inches, females, 3.2 inches. Upperparts grizzled russet and whitish, an indistinct buffy mantle on fore-back; underparts ochraceous; feet ochraceous. Found in "The Cascade Range in Oregon and the northern Sierra in California, south to Lake Tahoe." (Howell)

Pallid Yellow-bellied Marmot.—*Marmota flaviventris avara* (Bangs).

Smaller and paler than typical *flaviventris*. Total length male, 22 inches. Found in "Interior valleys and foothills of southern British Columbia and eastern Washington and Oregon." (Howell)

Southern Sierra Marmot.—*Marmota flaviventris sierræ* Howell.

Redder than typical *flaviventris* and with buffy mantle absent or greatly reduced. Found in "Higher parts of the southern Sierra Nevada from upper Kern River north to vicinity of Mono Lake." (Howell)

White Mountains Marmot.—*Marmota flaviventris fortirostris* Grinnell.

Resembling *sierræ* but smaller and paler; rostrum of skull short and heavy. Total length, males, 22.5 inches, tail vertebræ, 6.5 inches; hind foot, 2.9 inches. Found in the higher parts of the White Mountains, Mono County, California.

Nevada Marmot.—*Marmota flaviventris parvula* Howell.

Smaller and darker than *avara*. Total length, male, 15-20 inches, the smallest subspecies of *flaviventris*. Found in "Toyabe and Toquima Ranges, Nev.; and White Mountains, Cal. (occurring from about 7,800 to 10,000 feet altitude); probably occupies also other desert ranges in central Nevada." (Howell)

Engelhardt Marmot.—*Marmota flaviventris engelhardti* (Allen).

Smaller than typical *flaviventris*, more dark red on upperparts and on feet. Found in "Beaver and Parawan Mountains, southern Utah; also Midvale, Idaho; exact limits of range unknown." (Howell)

Golden-mantled Marmot.—*Marmota flaviventris nosophora* Howell.

Tail longer than that of *engelhardti* (6.5 inches as compared to 6 inches) color more ochraceous above and redder below, a golden buff mantle on anterior back. Found in "Rocky Mountain region of Montana, Idaho, and Wyoming, from Flathead Lake, Mont., south to the Wasatch Mountains, Utah, and east to the Bighorn Mountains, Wyo.; altitudinal range from about 3,000 to 11,800 feet." (Howell)

Black Hills Marmot.—*Marmota flaviventris dacota* (Merriam).

Size of typical *flaviventris*, colored like *nosophora*, but with redder underfur. Found in "Black Hills, S. Dak., and Bear Lodge Mountains, Wyo., southwest to Bridger Pass, Wyo." (Howell)

Park Marmot.—*Marmota flaviventris luteola* Howell.

Resembling *dacota* but with yellowish instead of reddish underparts and fore-back washed with whitish instead of buffy. Found in "Mountains of northern Colorado and southeastern Wyoming, from Park County, Colo., (and probably Fremont County) north to the Laramie Mountains, Wyo." (Howell)

Campion Marmot.—*Marmota flaviventris campioni* Figgins.

Resembling *luteola* in size but color different. Upperparts light cinnamon-brown; white on chin, lips, nose, throat, and fore-chest, belly darker. Total length, males, 26.8 inches; tail vertebræ, 7.2 inches; hind foot, 3.3 inches. Found in "detached range between the 'North Fork' and north Platte River, eight miles north of Higo, Jackson Co., Colo." (Figgins)

Warren Marmot.—*Marmota flaviventris warreni* Howell.

Like *dacota* in size but with larger skull, dark red in color, lacking much buff. Found in "Western Colorado, from Garfield County south to Saguache County; exact limits of range unknown." (Howell)

Dusky Marmot.—*Marmota flaviventris obscura* Howell.

Larger than *dacota* and equaling typical *flaviventris*; sexes about equal in size; tail long; color above, dark brown with whitish grizzling; face generally lacking any white markings. Found in "Upper slopes of high peaks in northern New Mexico and southern Colorado, from Pecos Baldy, N. Mex., north to Sierra Blanca, vicinity of Fort Garland, and to San Juan Range near Osier, Colo. (formerly in the Manzano and Datil Mountains, N. Mex.); occurs in Hudsonian and upper Canadian Zones from about 9,600 feet altitude to the summits of the peaks (13,300-13,700 feet)." (Howell)

Caligata Group

Northern Hoary Marmot.—*Marmota caligata caligata* (Eschscholtz). Plate XX.

Size large, total length, male, 28.5 inches, female, 27 inches; tail vertebræ, male, 8.5 inches, female, 7.6 inches; hind foot, male, 4 inches, female, 3.8 inches. General appearance of upperparts grizzled white and black, rich buffy on rump and lower back, black on top of head and face, with whitish patch in front of eyes; underparts soiled whitish; tail, above, buffy tipped with brown, below, dark brown; forelegs whitish, hind legs buffy; fore-and hind feet blackish. Found in "Alaska and Yukon, from the Portland Canal north on the coast to Bristol Bay, and in the interior

to the Endicott Range and the mountains lying westward of Fort Good Hope, Mackenzie." (Howell)

Glacier Marmot.—*Marmota caligata vigilis* (Heller).

Resembling typical *caligata* but darker in color, more black and brown, variable in color. Known only from type locality, west shore of Glacier Bay, Alaska.

Montague Island Marmot.—*Marmota caligata sheldoni* Howell.

Smaller than typical *caligata* and with shorter nasals. Total length, male, 26.8 inches. Known only from the type locality, Montague Island, Alaska.

Robson Hoary Marmot.—*Marmota caligata oxytona* (Hollister).

More black above than typical *caligata*; sexes nearly equal in size. Total length, male, 30 inches; one of the largest of the *caligata* group, as well as one of the darkest in color. Found in "Interior of northern British Columbia, southwestern Mackenzie (?) and southern Yukon, from Teslin Lake and Liard River south to Barkerville, British Columbia, and the Mount Robson region, British Columbia and Alberta." (Howell)

Okanagan Hoary Marmot.—*Marmota caligata okanagana* (King).

Almost as dark as *oxytona* but averaging more white. Total length, 28 inches for males. Found in "Gold and Selkirk Ranges, British Columbia, and probably main range of the Rocky Mountains in Alberta from Banff to Henry House; exact limits unknown." (Howell)

Montana Hoary Marmot.—*Marmota caligata nivaria* Howell.

Lightest colored of the *caligata* series, whiter than the other subspecies. Similar in size to *oxytona*. Found in "Upper slopes (at and above timberline) of high mountains of northwestern Montana and of Bitterroot and Salmon River Mountains, Idaho (limits of range imperfectly known)." (Howell)

Cascade Hoary Marmot.—*Marmota caligata cascadiensis* Howell.

Size of *oxytona* but more white and less black above. Found in "Cascade Range (at and above timberline) from Mount Rainier, Wash., north to southern British Columbia." (Howell)

Olympic Marmot.—*Marmota olympus* (Merriam).

Large, total length, male, 29-30 inches. Browner than the forms of *caligata*; above, brownish mixed with white. Found in "Upper slopes of the Olympic Mountains, Wash., above timberline (from about 4,000 feet altitude to near summits of peaks)." (Howell)

Vancouver Island Marmot.—*Marmota vancouverensis* Swarth.

"Entire body, legs, and tail dark Vandyke-brown, the underfur being of the same color, the long hairs more blackish and glossy." (Howell) Total length, male, 26-28 inches. Found on Vancouver Island, British Columbia.

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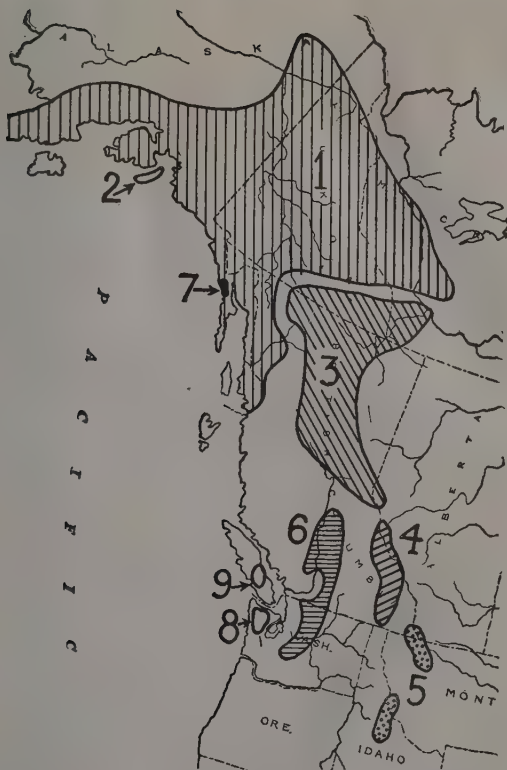


FIG. 47. Distribution of the species and subspecies of the *Marmota caligata* group, after A. H. Howell

- | | |
|--------------------------------------|---------------------------------------|
| 1. <i>Marmota caligata caligata</i> | 6. <i>Marmota caligata cascadenis</i> |
| 2. <i>Marmota caligata sheldoni</i> | 7. <i>Marmota caligata vigilis</i> |
| 3. <i>Marmota caligata oxytona</i> | 8. <i>Marmota olympus</i> |
| 4. <i>Marmota caligata okanagana</i> | 9. <i>Marmota vancouverensis</i> |
| 5. <i>Marmota caligata nivaria</i> | |

The Woodchuck is the best known of the large terrestrial Squirrels. Because of the wide geographic distribution of the genus, nearly every one who has spent any amount of time out of doors has come into contact with one or more of the different forms of Woodchuck or Ground-hog.

In the eastern states, the brownish red subspecies of *monax* are common creatures of the farm and country-side, where their plump, heavy-set figures are known to every farmer's boy. Here they live in stone-walls, in wood-piles, or in burrows which they dig near a clover field or other source of food supply. The burrows usually have several openings to the surface so that the animal may have a choice of more than one entrance or exit. Woodchucks occasionally climb up on stumps, or a short distance up small trees, but habitually spend their existence on the ground.

Although a Woodchuck will run for its burrow immediately on the approach of a Dog, when cornered it is a good match for a small Dog and puts up a good fight. Where it is exposed to constant persecution in a farming region, it is a cunning and wary creature, able to take care of itself. It may be decidedly destructive on a farm not only because of what it eats, but because of the large burrows it makes, which may be in places where holes and mounds of earth are obstructions to cultivation.

Woodchucks are not sociable creatures and generally adults are found only one to a burrow, and the animals are apt to be pretty well scattered over a region rather than concentrated in one spot, as is the case with Prairie-dogs.

After a long summer of successful foraging, the Woodchuck becomes very fat and his pelage takes on a richer and more glossy appearance. When winter sets in and food is scarce, the Woodchuck hibernates, passing a long period in a dormant condition not easily distinguished from death. During hibernation the normal bodily activities are suspended and the animal requires so little energy for his long sleep that the heavy layer of fat is sufficient; respiration and pulse are feeble and sluggish, body temperature is low, and the animal is insensible to its surroundings. If gradually warmed, he will soon revive and take notice of what goes on about him. The time for hibernation varies with the locality, depending on the length and severity of the winter, in the Atlantic States being

from October to March. "Ground-hog Day,"—February 2nd—takes its name from the supposition that the Ground-hog comes out for its first peep at weather conditions, to see if the sun is shining. The reasoning whereby the sight of its shadow drives the animal back for an additional six weeks' sleep is probably that an open, warm February means a late, cold spring!

In the Rocky Mountain region one finds the larger, gray Woodchucks, the Hoary Marmots, which live at high elevations. These Woodchucks, or Rock-chucks as they are sometimes called, live in the huge masses of slide-rock and are quite different in appearance from the *monax* and *flaviventer* forms. They have a loud, piercing whistle and are ever on the alert, seldom permitting a close approach. Their eyesight is keen, for they must be on the lookout not only for four-footed enemies, but for the large birds of prey.

Woodchucks are not very often eaten by man, but are, nevertheless, well flavored and deserving of more attention. Old or very fat animals would not fall into this category.

The fur of some of the Old World Marmots figures as quite an item in the fur trade, but skins of American species do not seem to have been much exploited, although the fur of the northern species is not unattractive.

Genus *Otospermophilus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22

Rock Squirrel.—*Otospermophilus grammurus*

and related forms

Names.—Rock Squirrel; Canyon Squirrel; Gray Squirrel; Ground Squirrel; Digger.

General Description.—A large grayish or brownish Squirrel, of terrestrial habits, with a long and moderately bushy tail. Size about as in the true Gray Squirrels; ears rather small; tail long, flat and bushy, but considerably narrower than the tails of the arboreal Squirrels; first upper premolar small and peg-like.

Color.—Sexes colored alike; seasonal variation not conspicuous.

Upperparts.—Grizzled gray, brown and dusky, grayest on shoulders, upper back and sides, brownest on rump to

mid-dorsal region; gray appearing in small spots to produce dappled effect; top of head light brownish; hands and feet light buffy; tail above, mixed gray, yellowish white and dusky, below like upperside but with more yellowish white; pelage of upperparts blackish at base.

Underparts.—Dirty grayish white with buffy suffusion. Immature much like adults.

Measurements.—Sexes of equal size. Total length, 18 inches; tail vertebræ, 8 inches; hind foot, 2.4 inches.

Geographical Distribution.—Rocky Mountain district and western states from Colorado and the Columbia River south into Mexico.

Food.—Seeds, nuts, acorns, grains, fruits, green vegetation, and some animal food.

Enemies.—Hawks, Coyotes, Foxes, Bobcats, Weasels, Badgers, and most of the small carnivores.

Species and Subspecies of the Genus *Otospermophilus*

Colorado Rock Squirrel.—*Otospermophilus grammurus grammurus* (Say).

As described. Found from eastern Colorado south into Arizona, New Mexico, and western Texas, west into south-eastern California.

Utah Rock Squirrel.—*Otospermophilus grammurus utah* (Merriam).

Very close to typical *grammurus* but smaller, ears larger, and back much redder. Found from the Wasatch Mountains of Utah eastward into Colorado.

Texas Rock Squirrel.—*Otospermophilus grammurus buckleyi* (Slack).

Resembling typical *grammurus* but with black on the anterior half of the dorsal surface and with much more black elsewhere; tail more bushy. Upperparts glossy black from nose to lower back and rump; some sprinkling of gray on flanks and thighs; hands and feet dark brown grizzled with gray; tail mixed gray and black; underparts light grizzled gray and dusky. Total length, 20 inches; tail vertebræ, 8.5 inches; hind foot, 2.4 inches. Found in southern and western Texas.

Couch Rock Squirrel.—*Otospermophilus grammurus couchii* (Baird).

Resembling *buckleyi* in having much black on upperparts; color pattern variable; head black and usually back gray, but sometimes entire animal is black, occasionally dark gray. Found in northeastern Mexico and reaching only the southern part of Texas, in the canyons of the Rio

Grande, Pecos and Devils Rivers, and throughout the Chisos and Davis Mountains.

Beechey Ground Squirrel; California Ground Squirrel.—

Otospermophilus grammurus beecheyi (Richardson).

Slightly smaller than typical *grammurus* but resembling it rather closely in external appearance. Upperparts mixed gray, light brown, and dusky in mottled pattern; brownest on rump and lower back; a dusky patch between shoulders; grayest on neck; two light bands of silver-gray from neck running down about to middle of body; top of head light grizzled brown and dusky; ears black on outer sides; hands and feet grayish; tail mixed yellowish gray and black, lighter in tone on lower side; underparts dirty yellowish gray. Total length, 17 inches; tail vertebræ, 7 inches; hind foot, 2.2 inches. Found in west-central California from San Francisco Bay south to Ventura County; in Sacramento Valley east of Sacramento River and in northern part of San Joaquin Valley. Plate XXIII.

Fisher Ground Squirrel.—*Otospermophilus grammurus fisheri* (Merriam).

Resembling *beecheyi* in size and general coloration, but paler, with more silvery gray on sides of neck and shoulders; not so much black on ear. Found in the southern San Joaquin Valley of California, north to Madera County, east to Panamint Mountains and south to Mexico.

Douglas Ground Squirrel.—*Otospermophilus grammurus douglasii* (Richardson).

Color pattern as in *beecheyi* but with a better-developed dark shoulder patch which is blackish or brownish black; not much black on ears; heavy black banding on hairs of tail. Total length, 19 inches; tail vertebræ, 8 inches; hind foot, 2.3 inches. Found from the Columbia River south to San Francisco Bay, California; north into Washington; limits of range unknown.

Catalina Island Ground Squirrel.—*Otospermophilus grammurus nesioticus* (Elliot).

Differing from *beecheyi* in darker color and less yellowish brown. Top of head and ears black, nose mixed black and ochraceous; sides of neck grayish with prolongation into stripe of grayish along shoulders; patch between shoulders mixed black and tawny ochraceous; tail above and below, buff mixed with black and bordered with black, lighter in tone on underside. Total length, 19 inches; tail vertebræ, 7.5 inches; hind foot, 2.4 inches. Found on Santa Catalina Island, Santa Barbara Islands, California.

Walnut Rock Squirrel.—*Otospermophilus grammurus juglans* (Bailey).

Resembling *couchii* but lacking the black cap on head. "Upperparts dark brownish gray with considerable blackish over head and ears, back coarsely variegated with irregular black-tipped white crescents or wavy crossbars. Lower-

parts varying from soiled whitish to rusty ochraceous; feet plain ochraceous." (Bailey) Total length, 20 inches; tail vertebræ, 9 inches; hind foot, 2.6 inches. Found in the Mogollon Mountains of New Mexico.

* * * * *

The Ground Squirrels of the genus *Otospermophilus* might be easily mistaken for Gray Squirrels (genus *Sciurus*) at first glance, but can be distinguished by their less busy tail and spotted or faintly mottled pelage. Furthermore, they run into holes in the ground, and if up a tree when danger approaches get down to the ground as soon as possible. They climb trees to a limited extent, but do not usually go very high. Not infrequently one will climb up a few feet to sun itself, or watch from the top of a stump or a tall stub.

These Squirrels haunt semi-open country in the northern parts of their range where they may be found in clearings, about overgrown fields or wherever brush and logs give good cover. Farther south they may occur in open forest or on rocky hillsides and shrub-covered slopes. In some sections they are known as Rock Squirrels because of their fondness for cliffs and rock masses. The members of this genus have rather a wide altitudinal range and live from plains at sea-level up to 8,000 feet elevation or higher.

In general, the habits of *Otospermophilus* are those of the genus *Citellus*, see page 213. These animals are very injurious to crops in settled districts and have still other claims upon the attention of man because some species, notably the California Ground Squirrel, serve as host for the flea which carries the bubonic plague. They store up food for periods of bad weather, become very fat toward the close of summer, and hibernate in the colder parts of their range.

The call-note of *Otospermophilus* is usually a single, loud whistle, but sometimes it utters a series of whistles in a descending scale. These Squirrels are strictly diurnal as are all our Ground Squirrels.

Genus *Callospermophilus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22.

Say Ground Squirrel.—*Callospermophilus lateralis* and related forms

Names.—Say Ground Squirrel, and various qualifying words applied to "Ground Squirrel"; Big Chipmunk; Big Striped Chipmunk; Golden Chipmunk; Golden-mantled Chipmunk; Golden-mantled Ground Squirrel. Plate XXIII.

General Description.—A small to medium-sized, ground-dwelling Squirrel, considerably larger than the Eastern Chipmunk (*Tamias*), but somewhat resembling it in external appearance. Body robust, heavier than that of the true Chipmunks but not as heavily built as many of the *Spermophiles* (*Citellus*); tail about half as long as head and body, flat, narrowly bushy; ears of medium size; first upper premolar small.

Color.—Sexes colored alike; some seasonal variation

Upperparts.—Summer: Shoulders to tail grizzled black, grayish white and buffy; crown of head, sides of neck, and shoulders washed more or less heavily with rusty yellowish to bright chestnut, this area in marked contrast to rest of upperparts and forming a sort of mantle; ring around eye and spot back of ear whitish; a pair of sharply defined, narrow, lateral stripes of yellowish white or gray extending from shoulders to thighs; above each light stripe a short black stripe which is usually imperfectly developed and may be absent entirely; below the light stripe a well-developed black stripe; below this lateral black stripe color of sides blends into color of underparts which is yellowish to yellowish white; upper surfaces of hands and feet buffy; upperside of tail mixed blackish brown and buffy, edged with buffy; lower side of tail light ochraceous or deep buffy, banded with black.

Winter pelage grayer and with mantle much less conspicuous. Immature like adults but grayer and without the bright mantle.

Measurements.—Sexes of equal size. Total length, 11 inches; tail vertebræ, 4 inches; hind foot, 1.6 inches.

Geographical Distribution.—Forested mountain slopes of the western states from California, Arizona, and New Mexico north into British Columbia.

Food.—Seeds, grains, buds, green vegetation, insects and their larvæ, occasionally young birds, eggs, and young Mice.

Enemies.—Hawks, Weasels, Coyotes, Foxes, Badgers, and other small carnivores.

Species and Subspecies of the Genus *Callospermophilus*

Say Ground Squirrel; Say Mantled Ground Squirrel.—

Callospermophilus lateralis lateralis (Say). Plate XXIII.

As described. Found in the mountainous, forested parts of Arizona and New Mexico north to Wyoming.

Cary Mantled Ground Squirrel.—*Callospermophilus lateralis caryi* Howell.

Upperparts grayer than in typical *lateralis*, with more strongly contrasting black and white stripes, white of sides and underparts clearer, and underside of tail darker; upperparts—summer—vinaceous cinnamon mixed with whitish; white dorsal stripes tinged with buff; mantle and top of head tawny. Total length, 11 inches; tail vertebræ, 3.8 inches; hind foot, 1.6 inches. Found in the Wind River and Gros Ventre ranges of Wyoming.

Charleston Mountain Ground Squirrel.—*Callospermophilus lateralis certus* Goldman.

"Distinguished by pale general coloration in combination with dark russet under side of tail; . . . a dark, rich russet, instead of ochraceous-buff or ochraceous-tawny tone."

Upperparts—summer—grizzled grayish brown; mantle tawny to tawny-ochraceous; "inner black stripes broad and distinct." (Goldman) Total length, 10 inches; tail vertebræ, 3 inches; hind foot, 1.5 inches. Found only in the Charleston Mountains in southern Nevada.

Nevada Mantled Ground Squirrel.—*Callospermophilus lateralis trepidus* Taylor.

Color in summer pelage: Mantle light ochraceous, three lateral stripes broad; dorsal area between stripes grizzled ochraceous, black and white; sides whitish with faint brownish tinge; underparts white, pelage slate-colored at base; tail above, black sprinkled with light ochraceous, below, darker ochraceous, banded with black. Total length, 10.8 inches; tail vertebræ, 4 inches; hind foot, 1.6 inches. Found in the Pine Forest Mountains, Humboldt County, Nevada.

Wortman Mantled Ground Squirrel.—*Callospermophilus lateralis wortmani* (Allen).

Similar to typical *lateralis* in size, but paler throughout and usually lacking the inner pair of black stripes; white lateral stripe whiter; mantle a much paler shade of reddish brown; upper surfaces of hands and feet almost white. Found from Sweetwater County, Wyoming, south into the northwestern corner of Colorado (Routt Co.).

Montana Mantled Ground Squirrel.—*Callospermophilus lateralis cinerascens* (Merriam).

Very similar to *lateralis* in size and general appearance. Inner black stripes present but short; general tone of dorsal

region grayish; mantle, in summer, dark chestnut-red; tail above, black mixed with pale buff, below, pale buff; underparts grayish white; outer side of hind limbs pale brownish. Total length, 11 inches; tail vertebræ, 3.8 inches; hind foot, 1.6 inches. Found from Yellowstone Park north through Montana and Idaho into Alberta.

Hollister Mantled Ground Squirrel.—*Callospermophilus lateralis tescorum* Hollister.

Larger, darker, and more richly colored than *cinerascens*; upperparts grizzled brownish gray; mantle extensive, dark reddish brown; lateral stripes broad and well defined, especially anteriorly; hands, feet, lower sides, and underparts creamy white, with buffy tinge on throat and upper foreleg. Total length, 12 inches; tail vertebræ, 4 inches; hind foot, 1.8 inches. Found in Alberta and British Columbia in the vicinity of the Moose Pass branch of the Smoky River.

Washington Mantled Ground Squirrel.—*Callospermophilus lateralis saturatus* (Rhoads).

Differing from typical *lateralis* in larger size and darker color. Summer pelage: Mantle chestnut mixed with black; throat, breast, sides, and thighs rusty; dorsal region grizzled rusty and black; underparts fulvous; tail above, blackish mixed and edged with rusty, below, reddish yellow banded with black. Total length, 12.2 inches; tail vertebræ, 4.5 inches; hind foot, 1.8 inches. Found in the Cascade Mountains of Washington; limits of range unknown.

Chestnut-tailed Ground Squirrel.—*Callospermophilus lateralis castanurus* (Merriam).

Mantle bright rusty chestnut; inner black stripe nearly as well developed as outer; dorsal region grizzled reddish brown, black, and yellowish; tail above, black mixed with yellow and reddish brown, below, deep chestnut banded with black; underparts washed with whitish to yellowish white. Total length, 11.5 inches; tail vertebræ, 3.7 inches; hind foot, 1.7 inches. Found in the Wasatch Mountains of Utah north into Wyoming; limits of range unknown.

Golden Chipmunk; Sierra Mantled Ground Squirrel; Gilded Ground Squirrel.—*Callospermophilus chrysodeirus chrysodeirus* (Merriam). Plate XXIII.

Differing from *lateralis* principally in having much better developed inner black stripes. Mantle rusty chestnut without any black mixture; dorsal region grizzled gray, light brownish and blackish; inner black stripe well defined, as long as outer; light stripe whitish or yellowish white and much longer than black stripes; underparts pale grayish white to pale yellowish white; upper surfaces of hands and feet washed with yellowish white to ochraceous; tail above, mixed black, yellowish, and grayish, below, deep ochraceous banded with black. Total length, 11.5 inches; tail vertebræ, 4.2 inches; hind foot, 1.8 inches. Found in

the mountains of southern and eastern Oregon south into California as far south as Tulare County.

Callospermophilus chrysodeirus trinitatis Merriam = *Callospermophilus chrysodeirus chrysodeirus*.

San Bernardino Mantled Ground Squirrel.—*Callospermophilus chrysodeirus bernardinus* (Merriam).

Resembling typical *chrysodeirus* but mantle duller in tone, and with shorter tail and hind foot. Mantle dull fulvous, top of head darker; otherwise very similar to typical *chrysodeirus*. Total length, 11 inches; tail vertebræ, 3.6 inches; hind foot, 1.7 inches. Found in the San Bernardino Mountains of California.

Inyo Mantled Ground Squirrel.—*Callospermophilus chrysodeirus perpallidus* Grinnell.

A pale desert-range race of *chrysodeirus*, compared with which it has "general coloration paler; middle of back, rump and sides, more ashy in tone, head less richly tawny, and under surface of body whiter. As a result, the black dorsal stripes give an impression of greater sharpness." (Grinnell) Total length, 10.6 inches; tail vertebræ, 3.6 inches; hind foot, 1.6 inches. Found in the Inyo Mountains and the White Mountains of California.

* * * * *

The Golden Mantled Ground Squirrels, or to reduce a long name, the Mantled Ground Squirrels, look and behave very much like big Chipmunks. They are found only in the western part of North America and their range does not meet anywhere with the range of the Eastern Chipmunks (*Tamias*), which they most resemble. From the Western Chipmunks, the Mantled Ground Squirrels are readily distinguished on the basis of their much larger size, less striped upperparts, and reddish or tawny head and shoulders.

The members of the genus *Callospermophilus* are true Ground Squirrels, or *Spermophiles*, living on the ground and seldom climbing any distance above it. They dig burrows in the earth, make use of crevices in the rocks or under logs, and are often found living side by side with the smaller Chipmunks (*Eutamias*). They are active, alert little rodents, beautiful when in full summer pelage, and are usually rather unsuspicious and easily observed. Where they are unmolested they quickly become audacious and I have seen them about a mining camp become so tame that they would come up to take food from the hands of the men. Mantled Ground Squirrels run about over the open ground, among the rocks

and bushes, and in about fallen tree trunks in their search for food, and can be seen at any time from sunrise to sunset.

These Squirrels hibernate, in the colder parts of their range going below ground before the first sharp days of autumn, and during the late summer they become exceedingly fat. They raise but one family of young a season, usually five or six in number. They have a chirping call-note, coarser in quality than that of the Chipmunks, and also utter a chattering, hurried alarm call when thoroughly frightened.

Genus *Citellus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{8}{8}$ = 22

Ground Squirrel.—*Citellus columbianus*

and related forms

Names.—Ground Squirrel; *Spermophile*; Gopher; Digger.

General Description.—A terrestrial, burrowing Squirrel of large size and short tail. Head rather rounded and nose



FIG. 48. Ground Squirrel

blunt; ears low and rounded; body robust; limbs short; tail a little more than one-quarter of total length, flat and moderately bushy; claws long, slightly curved, strong; first upper premolar of small size; living on the ground and very seldom climbing up into trees.

Color.—Sexes colored alike; seasonal variation not conspicuous.

Upperparts.—Grizzled yellowish, grayish and dusky; nose, head, fore and hind limbs rusty yellowish; tail above, rusty yellowish or rufous, the hairs banded with black and yellowish and tipped with rufous; underside of tail mixed grayish, yellowish, rufous and blackish, the black predominating.

Underparts.—Buffy to rusty yellowish, brightest on chin, throat, and base of tail.

Immature like adults but not as brightly colored.

Measurements.—Sexes of equal size. Total length, 15 inches; tail vertebræ, 4.2 inches; hind foot, 2.2 inches.

Geographical Distribution.—Most of western North America from Alaska to Mexico and from the Mississippi Valley to the Pacific Ocean.

Food.—Seeds, nuts, grains, green vegetation, roots, insects and their larvæ, occasionally young birds and mammals, eggs.

Enemies.—Hawks, Weasels, Badgers, Coyotes, Wolves, Foxes, Bobcats, and most of the small carnivores.

Species and Subspecies of the Genus *Citellus*

This is a very large and widely ranging group, the classification of which is in need of considerable revision. The differences between closely related forms are often so slight that they are difficult to set forth in print and the animals must be directly compared in the hand. There are several, more or less clearly defined, groups of *Spermophiles* and the arrangement followed in this field book is intended to show this grouping. The principal types of *Spermophiles* are easily distinguished from one another, but the intermediate varieties are not as well characterized.

Columbian Ground Squirrel.—*Citellus columbianus columbianus* (Ord).

As described. Found in the mountains from western Montana, eastern Oregon and Washington north to western Alberta and southern British Columbia.

Citellus erythroglyteius (Richardson) = *Citellus columbianus columbianus*

Alberta Ground Squirrel.—*Citellus columbianus albertæ* Allen.

Resembling typical *columbianus* but differing from it in heavier and more massive skull, and slightly paler color. Total length, 13 inches; tail vertebræ, 4.3 inches; hind foot, 2.3 inches. Found in the mountains of southern Alberta; vicinity of Canadian National Park.

GROUND SQUIRREL

Hudson Bay Ground Squirrel.—*Citellus parryii parryii* (Richardson).

A large, heavy-bodied Ground Squirrel with short tail. Upperparts mixed yellowish brown, gray, and dusky, the gray in small, irregular spots; top of head and sides of neck rich reddish brown to yellowish brown; sides, limbs, and underparts warm yellowish brown to ochraceous; tail above, mixed yellowish brown, grayish and black, with black gradually predominating toward the tip, terminal third or quarter of tail black; underside of tail yellowish brown to rufous edged with black and heavily tipped with black at end of tail. Total length, 17 inches; tail vertebræ, 4.6 inches; hind foot, 2.6 inches. Found in the Barren Ground region from Hudson Bay west to about 116° and from the Arctic coast south to about 61° latitude on the western shore of Hudson Bay; limits of range unknown.

Citellus parryii phæognathus (Richardson) = *Citellus parryii parryii*

Mackenzie Ground Squirrel.—*Citellus parryii kennicottii* (Ross).

Much like typical *parryii* but paler in general color, with less dusky on back and without such warm shades of ochraceous or brown on head and underparts. Total length, 17 inches; tail vertebræ, 5 inches; hind foot, 2.5 inches. Found on the Barren Grounds from the Coppermine River and Great Bear Lake west into Alaska; limits of range unknown.

Citellus barrowensis (Merriam) = *Citellus parryii kennicottii*

Kodiak Island Ground Squirrel.—*Citellus parryii kodiakensis* (Allen).

"A form with cinerous lower parts, less fulvous above, and more bushy tail. . . ." (Allen) Found on Kodiak Island, Alaska.

Yukon Ground Squirrel.—*Citellus osgoodi* (Merriam).

Size large; tail long for the group; very red on underparts in summer pelage. Upperparts grayish to yellowish, dorsal area with small, irregular spots of whitish; top of head from nose to ears, sides of head, limbs and underparts deep fulvous to rusty reddish; also individuals black all over are not uncommon. Males slightly larger than females. Total length, 18 inches; tail vertebræ, 5.6 inches; hind foot, 2.5 inches; weight, average $1\frac{3}{4}$ pounds. Found in Alaska along the Upper Yukon.

Bennett Ground Squirrel.—*Citellus plesius plesius* (Osgood).

Similar to typical *parryii* but smaller, with less yellowish in general coloration; also differing in cranial and dental characters. Upperparts yellowish gray mixed with blackish and whitish; top of head chestnut mixed with black; tail above, grizzled black, yellowish, and whitish, below cinnamon-rufous fringed with yellowish white; underparts, limbs, and sides of neck and face cinnamon-rufous. Total

length, 14 inches; tail vertebræ, 3.7 inches; hind foot, 2 inches. Found from the Stikine River (about latitude 56° N.) and the Ogilvie Range (about latitude 65° N.) in northern British Columbia and southern Yukon.

Nushagak Ground Squirrel.—*Citellus plesius ablusus* Osgood. Larger than typical *plesius* which it resembles in color; hairs of the tail with two or more annulations of black (fall pelage). Dorsal region and rump brownish spotted with grayish white; sides of head, neck, shoulders, and nape grayish; underparts dull grayish white with wash of creamy white on belly; feet creamy white; tail below, with tawny medial area banded with black; tip of tail grayish white (fall pelage). Total length, 16 inches; tail vertebræ, 4 inches; hind foot, 2.4 inches. Found on the base of the Alaskan Peninsula on the higher ground; along the Nushagak River and down to the tidal mud flats in places.

Stone Ground Squirrel.—*Citellus stonei* Allen.

Very similar to *plesius ablusus* and perhaps indistinguishable from it. Upperparts mixed brownish, grayish, and dusky, with small irregular spots of grayish; grayish on sides of neck, face, and shoulders; nose to top of head hazel; forefeet pale yellowish white; hind feet deep buffy; tail above, mixed gray, buff and black, the hairs broadly banded with black, underside of tail pale ochraceous banded with black and edged with grayish; underparts grayish washed with buffy. Total length, 14 inches; tail vertebræ, 3.5 inches; hind foot, 2.4 inches. Found on the Alaska Peninsula in the region of Pavlof Bay; limits of range unknown.

Shumagin Island Ground Squirrel.—*Citellus nebulicola* Osgood.

Resembling *C. parryii kodiacensis* "but smaller, shorter tailed and apparently paler colored;" (Osgood) Total length, 14 inches; tail vertebræ, 3.3 inches; hind foot, 2.1 inches. Found on Nagai Island, Shumagin Islands, Alaska.

Cape Lisburne Ground Squirrel.—*Citellus beringensis* (Merriam).

Resembling typical *parryii* but with more yellowish on dorsal region, whitish spotting more distinct, and larger nose patch. Upperparts fulvous, palest on back, with distinct spotting of buffy whitish; rusty red on nose and underside of tail. In winter pelage nose patch is brighter. Found on Cape Lisburne (Coal Veins) Alaska.

Richardson Ground Squirrel; Flickertail.—*Citellus richardsonii* (Sabine).

A medium-sized Ground Squirrel of rather uniform light yellowish to grayish coloration; tail short and not very bushy; ears very small. Upperparts buffy yellow to grayish washed with buffy; fine irregular light spots or wavy mottling on dorsal region; sides of neck, limbs and underparts varying from rich buffy to grayish; tail above mixed blackish

and ochraceous, fringed with buffy, beneath ochraceous. Total length, 12 inches; tail vertebræ, 3 inches; hind foot, 1.8 inches. Found from southern Saskatchewan and Alberta to Montana and North Dakota; in North Dakota found north and east of the Missouri River.

Uinta Ground Squirrel.—*Citellus armatus* (Kennicott).

A medium-sized, short-tailed Squirrel with fairly soft pelage. Upperparts mixed gray and black with wash of dark brown on dorsal region; brighter on shoulders and thighs; tail above and below mixed gray and black, banded with black and fringed with gray; underparts gray washed with buffy. Total length, 11 inches; tail vertebræ, 2.5 inches; hind foot, 1.8 inches. Found in the foothills and mountains of Wyoming, Montana, Idaho, and Utah.

Wyoming Ground Squirrel; Picket-pin Gopher.—*Citellus elegans* (Kennicott).

A small to medium-sized Squirrel with short, moderately bushy tail, small ears, soft pelage, and uniform brownish gray coloration. Upperparts mixed gray, buffy, and dusky with indistinct mottling; grayish on sides of head, neck and body, brownest along dorsal region; hands and feet grayish to pale buffy; tail above, mixed buffy, gray and black, below, light ochraceous banded with black and fringed with grayish; underparts light buffy. Total length, 11 inches; tail vertebræ, 2.7 inches; hind foot, 1.8 inches. Found in Wyoming, northeastern Utah, and northwestern Colorado; limits of range unknown.

Oregon Ground Squirrel.—*Citellus oregonus* (Merriam).

Resembling *armatus* in general coloration but underside of tail chestnut instead of grizzled gray and black. Upperparts mixed buff and dusky to give general buffy gray tone, with faint wash of pale brownish on head and dorsal region; hands and feet buffy; tail above, mixed gray, blackish, and light brownish, below, chestnut with subterminal band of black and gray edging; underparts buffy to creamy white. Total length, 11 inches; tail vertebræ, 2.5 inches; hind foot, 1.65 inches. Found in sagebrush plains of southern and eastern Oregon and northeastern California; limits of range unknown.

Belding Ground Squirrel.—*Citellus beldingi* (Merriam).

Like *oregonus* in size and general color but browner above. Upperparts buffy grayish with broad, poorly defined band of chestnut from nose to tail; sides yellower; tail above like back, below cinnamon-brown banded with black and edged with grayish; underparts yellowish gray to pale brownish. Total length, 10.4 inches; tail vertebræ, 2.8 inches; hind foot, 1.65 inches. Found in the "Transition and Boreal Zones on the Central Sierra Nevada, at least from Nevada County to Eldorado County . . ." California. (Grinnell)

Townsend Ground Squirrel.—*Citellus townsendi* (Bachman).

Similar to *beldingi* and to *oregonus*. Upperparts mixed

gray and dusky with dark reddish brown wash on dorsal region and outside of limbs; tail above mixed black and yellowish white, below, reddish; underparts grayish white to buffy. Total length, 12 inches; tail vertebræ, 3.6 inches; hind foot, 1.5 inches. Found on the plains of the Columbia in eastern Washington and on the Snake River plains of Idaho; limits of range unknown.

Mollis Group

Little Gray Ground Squirrel; Soft-haired Ground Squirrel.—

Citellus mollis mollis (Kennicott). Plate XXIII.

Size very small; pelage soft; tail short and narrow; ear small; coloration gray; claws weak and compressed. Upperparts uniform grayish in general tone, mixed silvery gray, yellowish brown and black; tail above mixed yellowish brown, black and whitish, below, pale ochraceous fringed with whitish; hands and feet grayish white; underparts silvery gray washed with pale buffy. Total length, 8 inches; tail vertebræ, 1.8 inches; hind foot, 1.3 inches. Found in Utah and Nevada; limits of range unknown.

Sagebrush Ground Squirrel.—*Citellus mollis artemisiæ* Merriam.

Smaller than typical *mollis* which it resembles in general coloration, but with tail grayer and less buffy fulvous; bullæ and teeth much smaller. Total length, 7.3 inches; tail vertebræ, 1.5 inches; hind foot, 1.2 inches. Found in Idaho, Fremont County to Bingham County; limits of range unknown.

Gray Soft-haired Ground Squirrel.—*Citellus mollis canus* (Merriam).

Smaller than typical *mollis*, with shorter hind foot and tail; grayer. Upperparts finely grizzled gray and dusky without buffy suffusion; underparts buffy to buffy gray; tail grayer and less fulvous than in typical *mollis*. Total length, 8 inches; tail vertebræ, 1.5 inches; hind foot, 1.2 inches. Found in Wasco County and adjacent sagebrush plains of northern Oregon; limits of range unknown.

Lost River Ground Squirrel.—*Citellus mollis pessimus* Merriam.

Resembling *artemisiæ* but larger and darker; tail longer, larger, and darker. Total length, 8.2 inches; tail vertebræ, 1.8 inches; hind foot, 1.3 inches. Found along lower Big Lost River, Fremont County, Idaho; limits of range unknown.

Malheur Soft-haired Ground Squirrel.—*Citellus mollis vigilis* (Merriam).

"Similar in general to *canus*; color iron-gray, finely lined, much as in *canus*, but more hoary-whitish." (Merriam) Skull characters different. Total length, 8.3 inches; tail

GROUND SQUIRREL

vertebræ, 1.5 inches; hind foot, 1.2 inches. Found from Malheur County, Oregon, south into northeastern Nevada.

Carson Valley Ground Squirrel.—*Citellus mollis washoensis* Merriam.

"Size large; coloration grizzled gray throughout, resembling *canus*. Skull large, long, and massive. . . ." (Merriam) Total length, 10.3 inches; tail vertebræ, 2 inches; hind foot, 1.4 inches. Found in Douglas County, Nevada; limits of range unknown.

Stephens Ground Squirrel.—*Citellus mollis stephensi* (Merriam).

Resembling typical *mollis*, "but in summer pelage head and neck to shoulders uniform pinkish buff. . . ." (Merriam) Total length, 8.2 inches; tail vertebræ, 2 inches; hind foot, 1.3 inches. Found in Owens Valley, Esmeralda County, Nevada; limits of range unknown.

Yakima Ground Squirrel.—*Citellus mollis yakimensis* (Merriam).

Resembling typical *mollis* "in size and general appearance but tail slightly shorter; color grayer and less buffy, but not so gray as *canus*. Nasal bones very much longer than in either *mollis* or *canus*." (Merriam) Total length, 8.5 inches; tail vertebræ, 1.8 inches; hind foot, 1.4 inches. Found in Yakima County, Washington; limits of range unknown.

Payette Ground Squirrel.—*Citellus idahoensis* Merriam.

"Largest of the *mollis* group. Similar in general to *mollis* but larger, with much stronger tendency to dappling, especially in young; tail longer, broader, and darker; eyelids white; anterior rim of ear usually white. Skull large and massive. . . ." (Merriam). Color varying from pale hoary grayish faintly suffused with buffy and more or less dappled on rump, to strongly suffused with pale buffy and distinctly dappled on back. Total length, 10.2 inches; tail vertebræ, 2.5 inches; hind foot, 1.4 inches. Found along Payette River and northern side of Snake River, Payette County, and southwestern Idaho.

Owyhee Ground Squirrel.—*Citellus leurodon* Merriam.

"Size rather large, about equaling *idahoensis* from the opposite side of Snake River, but with shorter tail. Color gray, not dappled except in the young. Teeth very large, equaling maximum of *idahoensis*. . . ." (Merriam) Total length, 9.5 inches; tail vertebræ, 1.9 inches; hind foot, 1.3 inches. Found in extreme southwestern Idaho, Owyhee County; limits of range unknown.

Spilosoma Group

El Paso Spotted Ground Squirrel; Spotted Sand Squirrel.—*Citellus spilosoma arens* (Bailey).

A small, spotted Squirrel with short tail, about half as long

as head and body; ears small; claws long and slender; tail round, slightly bushy toward tip; pelage short and harsh; iris hazel. Appearing in two color phases. Reddish phase: upperparts nearly uniform cinnamon with vinaceous tinge, spotted with small, irregular, whitish spots arranged more or less in longitudinal series; tail cinnamon like back above, more yellowish below; hands and feet whitish to pale yellowish; underparts and ring about eye white; iris hazel. Grayish phase: like reddish phase but ground color rusty brownish gray. Total length, 9.6 inches; tail vertebræ, 3.2 inches; hind foot, 1.4 inches. Found in "Sonoran Zone in southwestern Texas and the adjacent parts of Mexico—the Eastern Desert Tract." (Mearns) West into Lower Sonoran of New Mexico.

Padre Island Ground Squirrel.—*Citellus spilosoma annectens* (Merriam).

"Upperparts dull grayish brown; back beset with ill-defined buffy spots, margined posteriorly with dusky in unworn pelage; underparts soiled white. Eyelids white. Tail concolor with back or a little more fulvous, its distal half or two-thirds bordered with a subapical black band, beyond which the tips of the hairs are buffy ochraceous." (Merriam) Total length, 10 inches; tail vertebræ, 3.6 inches; hind foot, 1.5 inches. Found on "Southern coast region of Texas (Padre Island, Mustang Island, and adjacent mainland.)" (Mearns)

Apache Ground Squirrel.—*Citellus spilosoma macrospilotus* (Merriam).

"Ground color russet-brown, mixed with a few light-tipped hairs. Spots large, roundish, and far apart. Tail concolor with the body on its proximal half; yellow, ringed with black, on terminal half; and yellow beneath. Feet and undersurface white." (Mearns: *Mamm. Mex. Boundary*) Gray phase: drab gray ground color washed with hoary; whitish markings crowded and tending to form transverse wavy bars. Total length, 8.8 inches; tail vertebræ, 3 inches; hind foot, 1.2 inches. Found in the "Sonoran Zone, in the Elevated Central Tract." (Mearns), of southern Arizona; Lower Sonoran Zone of New Mexico.

Large Spotted Ground Squirrel.—*Citellus spilosoma major* (Merriam).

One of the largest of the subspecies of *spilosoma*. Ground color of upperparts light brown, spots indistinct and most numerous on rump; nose tinged with pale fulvous; tail pale reddish brown on proximal half above, buffy brown on terminal half, with submarginal black band, bordered with pale buff, below buffy; underparts white. Total length, 9.5 inches; tail vertebræ, 3.2 inches; hind foot, 1.4 inches. Found in Upper Sonoran Zone from eastern New Mexico north into Colorado as far as the valley of the Arkansas River.

Brown Ground Squirrel.—*Citellus spilosoma marginatus* (Bailey).

Differing from *arens* in darker color and heavier spotting and from *major* in finer, sharper spotting. "Upperparts bright cinnamon-brown, the whole back from ears spotted with whitish, the spots conspicuously edged with black." (Bailey) Total length, 9 inches; tail vertebræ, 2.7 inches; hind foot, 1.3 inches. Found in the Upper Sonoran Zone of the Davis Mountain plateau of Texas.

Park Ground Squirrel.—*Citellus spilosoma pratensis* (Merriam).

Smaller than *arens*. Upperparts uniform russet hazel with numerous whitish spots which have blackish posterior margins; tail above like back but mixed with yellowish and blackish hairs on proximal half, blackish bordered with yellowish brown on distal half, below, yellowish; underparts dirty white. Total length, 7.9 inches; tail vertebræ, 2.4 inches; hind foot, 1.2 inches. Found on the pine plateau at north foot of San Francisco Mountain, Coconino County, Arizona.

Dusky Spotted Ground Squirrel.—*Citellus spilosoma obsidianus* (Merriam).

Closely resembling *pratensis* but with longer feet and tail and darker coloration. Ground color of upperparts dull sepia brown, spots whitish but with black edging not very conspicuous. Total length, 8.2 inches; tail vertebræ, 2.7 inches; hind foot, 1.3 inches. Found in the Cedar belt northeast of San Francisco Mountain, Coconino County, Arizona; west into Upper Sonoran Zone of New Mexico.

Desert Ground Squirrel.—*Citellus cryptospilotus* (Merriam).

A small, pale form with only faint traces of spotting. Upperparts uniform buffy brown with yellowish or vinaceous tinge, without spots; tail above like back, below yellower, with subterminal black band which is more or less concealed; underparts whitish. Total length, 7.6 inches; tail vertebræ, 2.4 inches; hind foot, 1.3 inches. Found on the Painted Desert, Coconino County, Arizona.

Northern Spotted Ground Squirrel; Kennicott Ground Squirrel.—*Citellus obsoletus* (Kennicott).

Resembling the subspecies of *spilosoma* in general appearance but not spotted so conspicuously. Ground color of upperparts sandy gray with vinaceous tinge, indistinctly spotted with grayish white; hands and feet whitish; tail above like back, bushy at tip and banded with black, below, pale ochraceous, banded with black near tip and fringed with yellowish; underparts whitish to creamy white. Total length, 8.5 inches; tail vertebræ, 2.5 inches; hind foot, 1.3 inches. Found from western Nebraska to South Dakota, Colorado, and Utah, in sandy country; limits of range unknown.

Tereticaudus Group

Yuma Round-tailed Ground Squirrel.—*Citellus tereticaudus tereticaudus* (Baird). Plate XXIII.

A small Squirrel with plain, unspotted color pattern, very small ears, short, cylindrical tail and hard, coarse pelage. Upperparts (summer) uniform cinnamon-brown to pinkish buff, the tips of hairs whitish to give finely speckled effect; sides of head, limbs, and underparts white; tail above like back, mixed with blackish toward tip, below, yellowish with some black near tip. In winter, browner, with less cinnamon tinge. Total length, 10 inches; tail vertebræ, 4 inches; hind foot, 1.4 inches. Found in California from as far north as Needles and west as eastern San Diego County, south into Mexico; Lower Sonoran Zone.

Arizona Round-tailed Ground Squirrel.—*Citellus tereticaudus arizonæ* Grinnell.

Resembling typical *tereticaudus* but tail shorter and color of upperparts redder—deep pinkish cinnamon tipped with white. Total length, 9.4 inches; tail vertebræ, 3 inches; hind foot, 1.4 inches. Found in southwestern Arizona.

Death Valley Round-tailed Ground Squirrel.—*Citellus tereticaudus eremonomus* (Elliot).

Differing from typical *tereticaudus* in slightly different color of upperparts which is cinnamon with vinaceous tinge, darker than in typical *tereticaudus*, with dark color of base of pelage showing through. Total length, 10 inches; tail vertebræ, 3.5 inches; hind foot, 1.4 inches. Found in Death Valley, Inyo County, California.

Palm Springs Round-tailed Ground Squirrel.—*Citellus tereticaudus chlorus* (Elliot).

Resembling typical *tereticaudus* in size but color different. Upperparts olive-gray with brownish tinge; upperparts of limbs olive-gray; hands brownish, feet whitish; tail above like back, with mixed blackish and brown near tip, below, pale brown; underparts grayish white. Total length, 10 inches; tail vertebræ, 4 inches; hind foot, 1.65 inches. Found in Riverside and San Diego Counties, California; in Lower Sonoran Zone.

Mohave Ground Squirrel.—*Citellus mohavensis* (Merriam).

Resembling the subspecies of *tereticaudus* in size, proportions, and general color pattern but colored differently. Upperparts uniform sandy gray with very faint tinge of vinaceous, the hairs dusky at base and tipped with whitish producing a finely grizzled effect; hands, feet, and underparts white; tail above like back, mixed with dusky on terminal half, below whitish near base, mixed grayish and dusky for terminal half. Total length, 10 inches; tail vertebræ, 3 inches; hind foot, 1.5 inches. Found in the Lower Sonoran Zone of southern California, from Mohave Desert northeast to Daggett.

Dolans Spring Ground Squirrel.—*Citellus neglectus* (Merriam). Resembling typical *tereticaudus* but smaller and with shorter hind feet and tail. Upperparts grizzled grayish brown; underparts white; tail above and below like back, bordered with black. Total length, 8 inches; tail vertebræ, 3 inches; hind foot, 1.3 inches. Found at Dolans Spring, Mohave County, Arizona.

Rio Grande Ground Squirrel.—*Citellus mexicanus parvidens* (Mearns). Plate XXIII.

This Ground Squirrel is more or less intermediate in characters between the *spilosoma* group and the *tridecemlineatus* group; color pattern striped and spotted somewhat as in *tridecemlineatus*; tail fairly long and moderately bushy; size a trifle larger than *tridecemlineatus*; pelage rather coarse and harsh as in *spilosoma*. Upperparts marked from nape to base of tail with nine longitudinal stripes of whitish upon a ground color of pale yellowish brown to olivaceous, these white stripes more a series of broken dots than a well-defined continuous streak; top of head grizzled yellowish, grayish and dusky; ears small; hands and feet pale yellowish; underparts whitish to yellowish white; tail above, grizzled gray and black with faint wash of brown near base, below, pale yellowish mixed with black and grayish; iris hazel. Total length, 12.5 inches; tail vertebræ, 5 inches; hind foot, 1.7 inches. Found in southwestern Texas, in desert areas.

Tridecemlineatus Group

Thirteen-striped Ground Squirrel; Thirteen-lined Ground Squirrel; Striped Prairie Squirrel; Striped Gopher.—*Citellus tridecemlineatus tridecemlineatus* (Mitchill).

A small to medium-sized Ground Squirrel with conspicuously striped and spotted color pattern. Ears very small; body slender rather than robust; tail comparatively short; less than half of total length, and only narrowly bushy, upperparts heavily marked with many alternate longitudinal stripes of dark brown (with slight chestnut tinge) and whitish, the dark stripes with central rows of whitish spots; stripes on neck to shoulders solid and unbroken by spotting; end of nose yellowish brown; top of head indistinctly striped; sides of neck, lower sides of body, forelimbs and underparts yellowish; pelage of underparts dusky at base; tail above, mixed black and buffy, below, buffy mixed with black. Total length, 11 inches; tail vertebræ, 4.3 inches; hind foot, 1.4 inches. Found from southern Illinois and northern Missouri to northwestern Ohio, southern Michigan and central Wisconsin and west and northwest to North Dakota and Saskatchewan. Plates XXI and XXIII.

Missouri Thirteen-striped Ground Squirrel.—*Citellus tridecemlineatus badius* (Bangs).

Color of upperparts with more red than in typical *tridecemlineatus*. Ground color of upperparts rich chestnut; light markings buff; underparts strongly buff; tail above, chestnut at base, the hairs with blackish band and buffy tips, below, deep rusty red, tipped with buff. Total length, 11 inches; tail vertebræ, 3.9 inches; hind foot, 1.5 inches. Found in Missouri and northern Oklahoma.

Black Hills Ground Squirrel.—*Citellus tridecemlineatus olivaceus* (Allen).

About same size as typical *tridecemlineatus* but different in color. Ground color of upperparts dusky brown to blackish without any dark reddish tinge; pale markings pale buffy with slight olivaceous tinge; underparts strong cream buff, the hairs not dusky at base. Total length, 10 inches; tail vertebræ, 3.5 inches; hind foot, 1.4 inches. Found in the Black Hills, South Dakota; limits of range unknown.

Pale Striped Ground Squirrel.—*Citellus tridecemlineatus pallidus* (Allen).

Paler in color than typical *tridecemlineatus* and slightly smaller; ground color of upperparts chestnut sparingly mixed with black, the light markings creamy white, the light stripes nearly as wide as the dark ones; pelage of underparts pale yellowish white to base. Total length, 9 inches; tail vertebræ, 3 inches; hind foot, 1.3 inches. Found from Montana and southwestern North Dakota southeast to Kansas and south to western Texas and eastern New Mexico.

Small Striped Ground Squirrel.—*Citellus tridecemlineatus parvus* (Allen).

Smaller and paler than typical *tridecemlineatus* or *pallidus*. Ground color of upperparts russet with a few black-tipped hairs; light markings grayish white to pale creamy white; underparts grayish white. Total length, 8.2 inches; tail vertebræ, 3.2 inches; hind foot, 1.2 inches. Found from southeastern Montana through eastern Wyoming into northeastern Utah and northwestern Colorado.

Allen Striped Ground Squirrel.—*Citellus tridecemlineatus alleni* (Merriam).

Nearly as small as *parvus* but with coloration as dark as in typical *tridecemlineatus*; tail darker and with less reddish than in typical *tridecemlineatus*. Total length, 8.5 inches; tail vertebræ, 3 inches; hind foot, 1.3 inches. Found on the lower slopes of the Bighorn Mountains of Wyoming; limits of range unknown.

Hollister Striped Ground Squirrel.—*Citellus tridecemlineatus hollisteri* Bailey.

"Smaller and darker colored than *C. pallidus*, larger and darker than *parvus*. In general appearance much like *alleni*, but with darker brown back and crown, and with

light stripes of back more continuous." (Bailey) Total length, 9.3 inches; tail vertebræ, 2.8 inches; hind foot, 1.3 inches. Found in Lincoln County, New Mexico; limits of range unknown.

Texas Striped Ground Squirrel.—*Citellus tridecemlineatus texensis* (Merriam).

Smaller than typical *tridecemlineatus* and redder in color. Ground color of upperparts warm chestnut; light markings buffy with sprinkling of chestnut; tail above with tinge of rusty red on basal half, below strongly marked with rusty red; underparts and edging of tail buffy. Total length, 9 inches; tail vertebræ, 3.4 inches; hind foot, 1.3 inches. Found in a narrow strip, between 96° and 98° (west to 99° in northern Texas) through Texas into Oklahoma; limits of range unknown.

Franklin Ground Squirrel; Gray Gopher.—*Citellus franklini* (Sabine). Plate XXIII.

The only unstriped member of the *tridecemlineatus* group. A fairly large species of rather uniform coloration. Upperparts everywhere mixed dusky, buffy and grayish white, the general impression varying from an iron-gray pepper-and-salt to brownish marked with small light and dark spots; head and neck slightly darker than rest of upperparts; hands and feet dark gray; tail mixed black and gray, moderately bushy; underparts grayish to buffy. Total length, 14 inches; tail vertebræ, 5 inches; hind foot, 2 inches. Found in "The central United States and Canada, from Oklahoma and Illinois to the Athabaska River. . . ." (Bailey)

* * * * *

Ground Squirrels are so named because they are terrestrial in habit as contrasted with the arboreal or tree-dwelling Squirrels of the genus *Sciurus*. Most species of Ground Squirrels very seldom or never climb up on trees; in fact, many of the species live on deserts or treeless plains where they have no opportunity for climbing. Ground Squirrels may be distinguished from Tree Squirrels by their shorter and less bushy tails and by the fact that the animals seek a refuge underground. These Squirrels are seldom far from a burrow and run for it immediately upon the approach of danger. The genus *Citellus* is large and its members possess the ability to find a livelihood in almost any environment.

The large Arctic forms like *parryi* live along the river banks and plains of the far North. They are found on the Barren Grounds, in rocky places, and show an especial fondness for sandy hillocks.

Citellus columbianus and its immediate relatives frequent

mountain meadows where grasses, flowering plants, and low shrubs grow in the openings in the forests. It has a loud, ringing call-note or whistle and when one gives the alarm, others take it up, for these Squirrels live in colonies of a dozen to fifty or a hundred and more. *Columbianus* stands stiffly upright and emphasizes each call with a twitch of the short bushy tail. It is a conspicuous Squirrel because of its bright-colored limbs and underparts, as well as its large size. It sometimes climbs up onto logs or stumps to sun itself or to command a better view of the terrain. By midsummer it has become very fat and goes into hibernation very early, while there are yet many days of good weather. In the mountains of eastern Oregon I have found this species denned up by the middle of August and becoming scarce much earlier than that.

The Ground Squirrels of the sagebrush plains are typified by *armatus*, *elgans* or *oregonus* among the larger species, and by the *mollis* group for the smaller forms. These two groups may occur together in a locality, but the larger members are usually the more abundant, noisier, and more conspicuous. *Armatus* and its kin stand up like picket-pins, chirp a loud alarm note and colonize to some extent. They become very fat and hibernate early. *Mollis* and its subspecies are inclined to be quiet and unobtrusive in habits. The call-note is characteristically a Ground Squirrel's, but is a comparatively weak whistle that does not carry far. These small Squirrels delay hibernating longer than their larger relatives.

The desert-dwelling Ground Squirrels are represented by the *spilosoma* group, the members of which are light-colored and apparently well-specialized for a life in hot and dry surroundings. They have either very short periods of hibernation or, where the winter is not severe, no inactive period. They are abundant in sandy districts, and in the hottest deserts may be practically the only mammal moving about while the sun is out. The call-note is a lisping whistle.

The Thirteen-striped Ground Squirrels live on the prairies and are very easily recognized by their peculiar, much-striped, color pattern. They prefer the plains districts and brushy areas and do not occur in the forest or on damp ground. They are abundant in many places but are often able to escape observation because the long grass hides and blends with the

ANTELOPE GROUND SQUIRREL

striped pelage. The call-note is a long trilling whistle quite unlike the loud, single chirp or yelp of so many of the species of *Citellus*. Members of this group have long periods of hibernation, in the northern part of the range six months or more.

Where Ground Squirrels come into contact with agriculture they may, and generally do, become an economic problem. Because of their abundance and their fecundity, the rancher or farmer must have recourse to poison, traps, and guns to protect the crops. The number of young in a family of *Citellus* may vary from five to as many as thirteen or fourteen. Most of the species of *Citellus* raise but one family a year; possibly this holds true for all of the North American species. Wherever there is any extended period of hibernation, a second litter of young would not have time to store up fat for the long sleep.

Ground Squirrels store up food in their burrows, which is used as emergency rations in the spring before other food is available and probably for a short time after they enter the winter den in the fall.

Genus *Ammospermophilus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22.

Antelope Ground Squirrel.—*Ammospermophilus leucurus* and related forms

Names.—Antelope Ground Squirrel; Antelope Squirrel; Antelope Chipmunk; White-tailed Chipmunk. Plate XXIII.

General Description.—A small, terrestrial Squirrel, slightly larger than an Eastern Chipmunk, having a single, longitudinal, white stripe down each side; tail short, narrow, flat, and carried turned up over the back when running; ears rather small.

Color.—Sexes colored alike; seasonal variation slight, summer pelages somewhat brighter than winter.

Upperparts.—Mixed dark brown and vinaceous cinnamon or finely grizzled with whitish or yellowish, grayest on neck to mid-back, brownest on crown, rump, and outer sides of limbs; pelage blackish at base; a single, well-defined, white stripe on each side from shoulder to rump and separated from

the white underparts by a band of cinnamon like rump; hands and feet yellowish white to buffy white; tail blackish, tipped with whitish above, white below, narrowly banded with black.

Underparts.—Glistening white.

Immature striped like adults, but much grayer.

Measurements.—Sexes of equal size. Total length, 8.5 inches; tail vertebræ, 3 inches; hind foot, 1.5 inches.

Geographical Distribution.—Arid western and southwestern states from Oregon south into Mexico.

Food.—Seeds, grains, and green vegetation; occasionally insects; meat when obtainable.

Enemies.—Snakes, Hawks, Coyotes, Foxes, Bobcats, Weasels, Badgers, and most of the small carnivores.

Species and Subspecies of the Genus *Ammospermophilus*

Antelope Ground Squirrel.—*Ammospermophilus leucurus leucurus* (Merriam).

As described. Found in the Sonoran Zone from Mexico north to Mono County, California.

Cinnamon Ground Squirrel.—*Ammospermophilus leucurus cinnamomeus* (Merriam).

Resembling typical *leucurus* in size and color pattern, but upperparts with a decided cinnamon-brown tone. Total length, 8.5 inches; tail vertebræ, 2.5 inches; hind foot, 1.6 inches. Found in northern Arizona, southern Utah, southwestern Colorado, and northeastern New Mexico; Oregon(?)

Ammospermophilus leucurus vinnulus (Elliot) = *Ammospermophilus leucurus cinnamomeus*.

El Paso Ground Squirrel; Texas Antelope Squirrel.—*Ammospermophilus leucurus interpres* (Merriam).

Darker and more richly colored than typical *leucurus* and with more gray on head; pelage longer and more silky. Size as in typical *leucurus*. Found in the "Sonoran Zone, in the Eastern Desert Tract of New Mexico and Texas." (Mearns).

Nelson Ground Squirrel.—*Ammospermophilus nelsoni nelsoni* (Merriam). Plate XXIII.

Larger and paler than *leucurus*. Upperparts, in summer, dull fulvous or yellowish brown, pelage blackish at base; lateral stripe white, with ochraceous tinge; tail above, black fringed with white, below, buffy white; underparts buffy white. In winter, somewhat darker on upperparts. Total length, 9 inches; tail vertebræ, 3 inches; hind foot, 1.6 inches. Found in the Lower Sonoran Zone in California from vicinity of Bakersfield north into Merced County, west to San Luis Obispo County.

ANTELOPE GROUND SQUIRREL

Los Baños Antelope Chipmunk.—*Ammospermophilus nelsoni amplius* Taylor.

Larger and paler than typical *nelsoni* and with stripes less distinct. In summer color of upperparts light buff, almost whitish on sides of face and nape of neck. Total length, 9.7 inches; tail vertebræ, 3 inches; hind foot, 1.6 inches. Found in the San Joaquin Valley, vicinity of Los Baños, Merced County, California.

Harris Ground Squirrel; Gray-tailed Antelope Squirrel.—*Ammospermophilus harrisii harrisii* (Audubon and Bachman).

Resembling *leucurus* in general appearance but more strongly colored, tail longer and not white below. Upperparts mixed blackish and vinaceous cinnamon, finely speckled with whitish to give pepper-and-salt appearance; grayest on neck and shoulders; lower sides and outer sides of limbs grizzled cinnamon; tail above, blackish, the hairs broadly tipped with whitish, below, gray (mixed black and white); underparts whitish. Total length, 9.2 inches; tail vertebræ, 3.2 inches; hind foot, 1.6 inches. Found in the Sonoran Zone of Arizona and New Mexico and north to southern Utah and Nevada.

Rock Squirrel.—*Ammospermophilus harrisii saxicola* (Mearns).

Paler than typical *harrisii* and with a longer tail; light markings everywhere more extensive. Total length, 9.8 inches; tail vertebræ, 3.8 inches; hind foot, 1.6 inches. Found in the bare granite mountain ranges of the Lower Sonoran Zone of Arizona, south into Mexico.

* * * * *

The members of the genus *Ammospermophilus* are found on dry, arid plains, on deserts, or on the lower slopes of mountain ranges. They are true Ground Squirrels and live among the bushes or in the rocks. They take their name of Antelope Ground Squirrels from their habit of carrying the tail curled up over the back, when the white underside gives the animal the appearance of a white rump patch like that of the Pronghorn Antelope. By this habit the Antelope Ground Squirrels may be easily recognized. They are diurnal in habit and are active throughout the day. Over most of their range they do not hibernate, but where they encounter a long period of snow they are dormant for several months.

The Antelope Ground Squirrel has a roving disposition and wanders extensively in the course of a day's search for food. Seeds are carried in the internal cheek-pockets and stored in underground burrows. This Squirrel has a chirping call-note, a sharp whistle, and a fine trilling call, to suit the various needs

for utterance. It sits upright like a Prairie-dog upon occasions and often displays great curiosity. Impulsive and nervous in behavior, it may come close up to an intruder or become suspicious and be very difficult to observe.

These Squirrels are prolific and rear several families a year, the young numbering from four to twelve in a litter.

Genus *Cynomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22.

Prairie-dog.—*Cynomys ludovicianus*

and related forms

Names.—Prairie-dog; Barking Squirrel; Burrowing Squirrel; Prairie Squirrel; Wishtonwish; Petit Chien. The



FIG. 49. Prairie-dog

name in most common usage is Prairie-dog, the other names listed appearing, for the most part, only in journals and narratives of early explorers, such as Lewis and Clark, Pike, and Brackenridge.

General Description.—A heavy-bodied, robust, terrestrial Squirrel, short-tailed, social in habit, and with characteristic

¹For a full revision of the Prairie-dogs see N. Hollister, *North American Fauna*, No. 40, 1916.

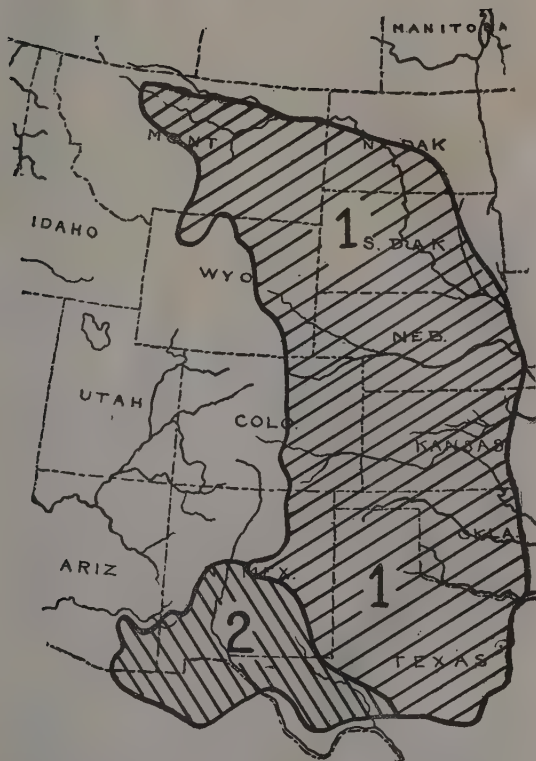


FIG. 50. Distribution of the subspecies of *Cynomys ludovicianus*, after Hollister

1. *Cynomys ludovicianus ludovicianus*
2. *Cynomys ludovicianus arizonensis*

"bark." About the size of a small Woodchuck; head broad and rounded; ears low and rounded; body stout; tail very short, well haired but flat; legs short, wrist and heel well furred, with a tuft of hair in center of palm; forefeet with five claws; mammae 8 to 12; cheek-pouches present; pelage rather coarse; iris hazel. Plate XX.

Color.—Sexes indistinguishable as to color.

Upperparts.—Dark pinkish cinnamon with fine grizzling of black and buff; whitish or buffy on sides of nose, upper lip, and eye-ring; sides, arms, and legs pale ochraceous-cinnamon; feet buffy; tail like back except for terminal third, which is blackish, underside of tail paler than above.

Underparts.—Whitish to buffy white.

Winter pelage fuller, softer, and longer than summer, grayer, with blackish on forehead.

Young.—Above ochraceous-cinnamon, with fewer intermixed white and black hairs than adults.

Pelage is molted and replaced by new coat from March to May, and August to November.

Measurements.—Females very slightly smaller than males. Males, total length, 14.5–16.5 inches; tail vertebræ, 3–4 inches; hind foot, 2.5–3.3 inches. Weight, from 2 lbs. 3 oz. for females to 3 lbs. for males.

Geographical Distribution.—Great Plains region.

Food.—Native vegetation and crops. Grasses and green vegetation, roots; at times more or less omnivorous.

Enemies.—Large Hawks, Eagle, Raven, Coyote, Badger, Black-footed Ferret, and occasionally other carnivores.

Species and Subspecies of the Genus *Cynomys*

Subgenus *Cynomys*

Black-tailed Prairie-dog.—*Cynomys ludovicianus ludovicianus* (Ord). Plate XX.

The animal just described. Found in "Great Plains region of western United States, south from near the Canadian border in Montana to west-central Texas (Mason County to eastern Pecos Valley); east to about the ninety-seventh meridian in Nebraska, Kansas, and Oklahoma; west to the Rocky Mountains in central Montana, Wyoming, and Colorado, and in extreme eastern New Mexico. Chiefly Upper Sonoran, but also ranging into Transition and Lower Sonoran Zones. Introduced colonies exist, or have been

PRAIRIE-DOG

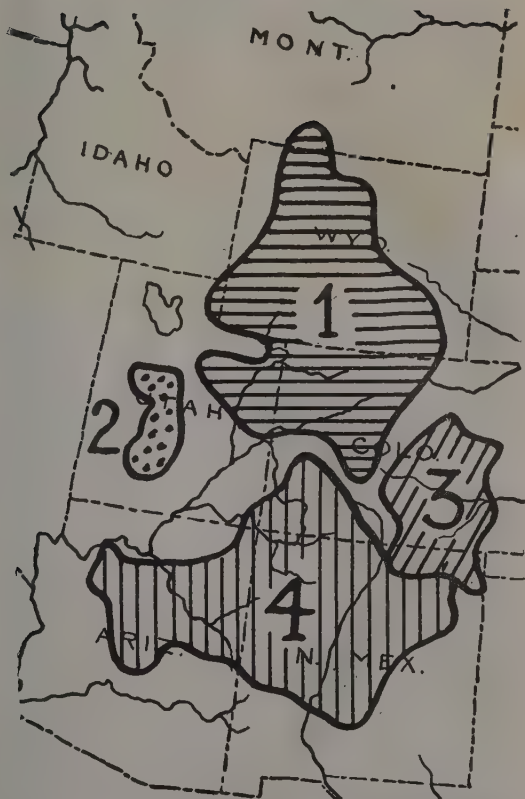


FIG. 51. Distribution of the species of the subgenus *Leucocrossuromys*, after Hollister

1. *Cynomys leucurus*
2. *Cynomys parvidens*
3. *Cynomys gunnisoni gunnisoni*
4. *Cynomys gunnisoni zuniensis*

(The artist has carried the limits of 1, 3, and 4 a little too far to the eastward.)

reported as formerly existing, in Sac County and at Burlington, Iowa; near Monroe, Louisiana; at Seneca, South Carolina; and on Nantucket Island, Massachusetts." (Hollister)

Arizona Prairie-dog.—*Cynomys ludovicianus arizonensis* (Mearns).

Slightly larger than typical *ludovicianus* and more brightly colored. Found in "Southeastern Arizona, southern and central New Mexico, southwestern Texas, and adjacent portions of Sonora and Chihuahua, Mexico. North to San Pedro and Santa Rosa, New Mexico; east to the Pecos Valley; west to Huachuca, Arizona; south to San Diego and Casas Grandes, Chihuahua, and to Presidio County, Texas." (Hollister)

Subgenus *Leucocrossuromys*

White-tailed Prairie-dog.—*Cynomys leucurus* Merriam. Plate XX.

More like a Ground Squirrel (*Citellus*) in appearance than the forms of *ludovicianus*. Tail less than one-fifth of the total length, tipped with white instead of black, living more in the mountains than *ludovicianus*, which is a plains type. Color, above, buffy streaked with blackish, dark brown spots above the eye and on cheek; below, clear buffy. Tail clear white for terminal half, white banded with blackish above for first half. Total length, 13.5–14.8 inches; tail vertebrae, 1.8–2.4 inches; hind foot, 2.4–2.6 inches. Found in "Irregular areas in the mountainous parts of Montana, Wyoming, Utah, and Colorado. South from the Bighorn Basin, in southern Montana, across central and southwestern Wyoming into western Colorado and northeastern Utah; Utah east to the Laramie Mountains, Wyoming, and into North Park, Colorado; south into the lower Gunnison Valley; west a few miles across the Bear River Divide into extreme northern Utah and, farther south, into the Green River Valley. Chiefly Transition Zone." (Hollister)

Utah Prairie-dog.—*Cynomys parvidens* Allen.

Closely resembling *leucurus* but redder and less buffy above, smaller. Upperparts (summer) cinnamon. Total length, 12.2–15.4 inches. Found in "Mountain valleys of central Utah in the Sevier River region; south from Nephi to Iron and Garfield Counties." (Hollister)

Gunnison Prairie-dog.—*Cynomys gunnisoni gunnisoni* (Baird).

Resembling *leucurus* but darker, with less buffy and less sharply marked on cheeks; tail with less white, more like back for first half of its length. Total length, 12.2–14.6 inches. Found in "Rocky Mountain region of central and central-southern Colorado and northern New Mexico. North into South Park, Colorado; east to El Paso, Fremont, and Huerfano Counties, Colorado; south into the Sangre de

Cristo and Jemez Mountains, New Mexico; west to western Gunnison and Hinsdale Counties, Colorado, and to western Rio Arriba County, New Mexico. Chiefly Transition Zone, but also in Upper Sonoran and lower parts of Canadian Zone." (Hollister)

Zuni Prairie-dog.—*Cynomys gunnisoni zuniensis* Hollister.

Somewhat larger than typical *gunnisoni*, with larger hind foot. Pelage more ochraceous and cinnamon, less yellow and black. Total length, 13.2–15 inches; tail vertebrae, 2.2–2.5 inches; hind foot, 2.3–2.5 inches. Weight, male, 2 lbs. Found in "Southwestern Colorado, extreme south-eastern Utah, northwestern and west-central New Mexico, and north-central Arizona. North in western Colorado to Montrose County; northeast in New Mexico in the Rio Grande Valley to Espanola and east to Pecos and the Manzano Mountains; south on the west side of the Rio Grande Valley to Sierra and Socorro Counties, New Mexico; west in central Arizona to Prescott and the Hualpai Indian Reservation. Chiefly Upper Sonoran, but also in Transition Zone." (Hollister)

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The Prairie-dog is a fat, short-tailed Ground Squirrel of sociable habits. As part of the name implies, this animal is a creature of the prairies and open plains, but the other part of the name is false for he is not even distantly related to the Dog.

As may be seen from the map, the range of this genus is limited, and Prairie-dogs are found only in western North America. The genus is peculiar to the New World and only six species and subspecies are comprised in the group.

We find early mention of these Squirrels in the journals of Lewis and Clark and other pioneer explorers. The sight of the large "dog-towns", covering a great many acres in favorable localities, so impressed the first settlers that the Prairie-dog became a much-discussed feature and no geography or account of the West failed to mention the animal, generally as part of the trinity—Prairie-dog, Rattlesnake, and Burrowing Owl.

Today the West is changing; ranching is breaking up the large "dog-towns"; the Prairie-dogs are being exterminated in the agricultural sections; and the belief in the interesting story of the friendships between mammal, bird, and snake is sadly shaken by the discovery that the Burrowing Owl and the snake feed on the young "Dogs" when they are lucky enough to catch one, and the Prairie-dog may eat a young Owl, or

bury a Rattlesnake alive when he gets one down a hole. There are still, however, many regions where the Prairie-dog is a conspicuous part of the plains life and there are some of the large "towns" left. Bailey (N. A. Fauna, No. 25, p. 90) describes a practically continuous town 100 miles wide by 250 miles long and containing 400,000,000 individuals (1901).

The Prairie-dog digs a large burrow, often with a built-up rim about the entrance, and as he has sociable habits, all of the Prairie-dogs of a given locality will usually be found in the one spot. The animals are diurnal, active only by day, and under normal circumstances a colony will have part or most of its members scattered about feeding within the confines of the colony or at a short distance from the outermost burrows during the morning or afternoon. A few animals may, perhaps, be especially on the lookout for enemies. If a man approaches, the alarm note, a piercing chirp or whistle, sends all of the Prairie-dogs scurrying to the nearest burrows. At the verge of safety they all stop and watch, some standing up stiff and rigid, and unless the colony has been unduly molested many of the animals will delay the dash down the burrow until the last possible moment. Meantime the alarm note has been caught up and carried throughout the "town" and as long as the intruder is in the vicinity the call will be given. When the animals nearest the danger pop down out of sight, those out of burrows may still keep watch and send the alarm.

Prairie-dogs are always plump, but soon after the summer has brought out the grasses, clover, and low-growing plants they feed on, they become very fat. In the colder parts of the animal's range this fat serves a useful purpose during the short period of hibernation. Vegetation is eaten close near a Prairie-dog "town" and when the colony is located on the borders of a grain-field much damage is done. Aside from the material destruction to crops the Prairie-dog proves a nuisance because of the many large holes he digs into which a horse may step. The Badger visits the towns and digs out the Prairie-dogs, making even larger holes to trip a rider.

The Prairie-dogs have many enemies, but because of the excellent watch they keep are often able to escape such dangers as Eagles and Coyotes. The Black-footed Ferret and the Badger go into the holes after their prey, and against

WESTERN CHIPMUNK

rump and hind feet buffy; tail longer. Total length, 9.6 inches; tail vertebræ, 4.5 inches; hind foot, 1.44 inches. Found "on the upper slopes of the southern Sierra Nevada from San Joaquin River south to Tule River and east to Mt. Whitney and Olancho Peak." (Howell)

Inyo Chipmunk.—*Eutamias speciosus inyoensis* Merriam.

Resembling typical *speciosus* but "facial stripes less pronounced; post-auricular patches ill defined; rump grizzled golden yellowish instead of gray; middle dorsal stripe blacker; gray on back of neck more extensive; black tip of tail shorter." (Merriam) Total length, 9 inches; tail vertebræ, 4 inches; hind foot, 1.35 inches. Found on "Boreal summits of White and Inyo mountains, California." (Merriam)

Tahoe Chipmunk.—*Eutamias speciosus frater* (Allen).

Resembling typical *speciosus* but with dark colors more pronounced and less black on tail; slightly smaller in size. Total length, 9 inches; tail vertebræ, 4.8 inches; hind foot, 1.3 inches. Found in California in "Transition and Boreal Zones on the Sierra Nevada in the vicinity of Summit, Placer County, and Lake Tahoe, south to vicinity of Kearsarge Pass, in Inyo County." (Grinnell)

Palmer Chipmunk.—*Eutamias palmeri* Merriam.

About the size of typical *quadrivittatus* but differing in coloration. Dorsal stripes rather short except median dark stripe which reaches between ears; much gray on upperparts; dark stripes pale rusty, median stripe darker, outer pair obsolete; facial stripes faintly developed; ear patch ill defined, whitish; tail black, edged with yellowish above, rufous below, banded with black, edged with yellowish. Total length, 8.8 inches; tail vertebræ, 3.8 inches; hind foot, 1.32 inches. Found only on the summit of Charleston Peak, Clark County, Nevada.

Townsendii Group

Characterized by large size and (for most part) dark pelage.

Townsend Chipmunk. — *Eutamias townsendii townsendii* (Bachman). Plate XXIV.

Very large, with dark color pattern; five dark stripes. Upperparts varying with season from yellowish olive-gray to a rich yellowish brown; dark stripes black or brownish black; facial stripes and ear patch grayish; feet grizzled buffy gray; tail above like back, banded with black and edged with whitish, below, rufous, black and whitish; underparts white. Total length, 10 inches; tail vertebræ, 4.5 inches; hind foot, 1.44 inches. Found in humid coastal region of Oregon, Washington, and southwestern British Columbia.

Cooper Chipmunk.—*Eutamias townsendii cooperi* (Baird).

Resembling typical *townsendii*, but lighter colored, grayer. Light-colored dorsal stripes grayish instead of brownish;

rump grayish. Measurements about as in typical *townsendii*. Found in Cascade Mountains of Washington where it has been taken in Skamania and Kittitas Counties and about Mt. Ranier at elevations of 4500 and 5500 feet.

Redwood Chipmunk.—*Eutamias townsendii ochrogenys* Merriam.

Somewhat similar to typical *townsendii*, but duller colored, with less conspicuous striping; underparts not white. Upperparts grizzled olive-gray and golden; dark stripes brownish black, outer pair of dark stripes very faint; outer light stripes grayish, inner pair almost same tone as unstriped upperparts; ear patch grayish; cheeks and sides of nose ochraceous; underparts washed with buffy. Total length, 10.5 inches; tail vertebræ, 4.6 inches; hind foot, 1.52 inches. Found in California in "narrow, humid northwest coast strip (Transition and Boreal Zones) from the Oregon line south to Cazadero, Sonoma County; interiorly as far as Cuddeback, Humboldt County, and Sherwood, Mendocino County." (Grinnell)

Siskiyou Chipmunk.—*Eutamias townsendii siskiyou* Howell.

Differing from *ochrogenys* in grayer coloration; light dorsal stripes grayish; sides of head and face with less ochraceous; underparts only faintly washed with buff. Total length, 10.7 inches; tail vertebræ, 4.2 inches; hind foot, 1.46 inches. Found in "the Siskiyou Mountain region of northern California and southern Oregon, ranging north to the upper Rogue River Valley, Oregon." (Howell)

Allen Chipmunk.—*Eutamias townsendii senex* (Allen).

Resembling *siskiyou* but grayer, especially on rump and thighs; underparts white. Upperparts grizzled grayish, sides washed with fulvous or rufous; outer light stripes grayish white, inner grizzled gray and fulvous; inner dark stripes blackish, mixed with rufous; outer stripes rufous; face markings rufous and whitish; ear patch gray; feet tinged with buffy; tail edged with whitish. Total length, 10 inches; tail vertebræ, 4.3 inches; hind foot, 1.44 inches. Found from Mariposa County, California, north along Boreal Zone of Sierra Nevada and Cascade ranges to Crook County, Oregon.

Sonoma Chipmunk.—*Eutamias townsendii sonomæ* (Grinnell).

Intermediate in color of underparts between typical *townsendii* and *ochrogenys*; brighter above than *ochrogenys*, more conspicuously striped. Upperparts bright cinnamon-rufous; median dorsal stripe black, outer dark stripes mixed with rusty; light-colored stripes gray obscured with rusty, outer pair of light stripes clear ashy gray; sides cinnamon-rufous, ear patch clear white; underparts white, sometimes with creamy wash on mid-ventral region. Total length, 10 inches; tail vertebræ, 4.5 inches; hind foot, 1.44 inches. Found in California in Mendocino, Solano, Sonoma, Trinity, and Yolo counties at elevations of 500 to 6,000 feet.

Marin Chipmunk.—*Eutamias townsendii alleni* Howell.

Slightly smaller than *sonomæ*; pelage darker than *sonomæ* but brighter than *ochrogenys* and more distinctly striped; outer pair of light stripes with strong buffy tinge; underparts with light wash of buffy. Total length, 9.2 inches; tail vertebræ, 4.2 inches; hind foot, 1.48 inches. Found in "Coast region of Marin County, California, from Point Reyes east to Mount Tamalpais." (Howell)

Long-eared Chipmunk.—*Eutamias quadrimaculatus* (Gray).

A large-eared, bright-colored species. Upperparts grizzled grayish and rufous; three internal dark stripes well defined, black mixed with rufous; outer pair of dark stripes less conspicuous, rufous in color; inner light stripes gray, mixed with rufous, outer pair nearly clear whitish; broad, facial stripes and large ear patch white; black markings on sides of face and head conspicuous; feet buffy; tail above, rufous at base of hairs, banded with black, edged with whitish, below, broadly rufous, black banded, white edged; underparts white. Total length, 10.5 inches; tail vertebræ, 4.8 inches; hind foot, 1.44 inches. Found in "Upper Transition Zone along west slope of Sierra Nevada, from Yosemite National Park northward at least to Quincy, Plumas County." (Grinnell)

Merriam Chipmunk.—*Eutamias merriami merriami* (Allen).

Size rather large; color pattern dull and grayish. General tone of upperparts grizzled grayish and buffy; dark dorsal stripes five in number; inner pair of light stripes colored like flanks, outer pair light grayish; ear patches inconspicuous, gray; dark stripe through eye from nose to ear; hairs of tail above, black, banded and tipped with buffy to whitish, below rufous, banded with black, edged with buffy; underparts white. Total length, 10 inches; tail vertebræ, 4.6 inches; hind foot, 1.3 inches. Found in "Upper Sonoran and lower Transition Zones on the mountains of the San Diegan district, south to the Cuyamaca and Laguna mountains, San Diego County; also north and east through the Tehachapi mountains and along the western foothills of the Sierra Nevada at least to Raymond, Madera County; also north through the coast ranges to San Luis Obispo County." (Grinnell) Plane XXIV.

Santa Cruz Chipmunk.—*Eutamias merriami pricei* (Allen).

Resembling typical *merriami* in size and dull type of color pattern, but much browner where *merriami* is gray. Upperparts mixed brown and gray; dark dorsal stripes mixed hazel and black, outer pair of dark stripes with very little black; inner light stripes with very little gray; outer pair more conspicuously gray; sides warm tawny; underparts white, lightly tinged with buffy on abdomen. Total length, 10 inches; tail vertebræ, 4.6 inches; hind foot, 1.4 inches. Found in "humid Transition and Upper Sonoran in the coast region south of San Francisco Bay, from San Mateo

County to Monterey County, inclusive" (Grinnell)

Kern Basin Chipmunk.—*Eutamias merriami kernensis* Grinnell and Storer.

Similar to typical *merriami* but even grayer; ashy gray on sides of head and neck; dorsal stripes narrow; underside of tail ochraceous tawny. Measurements same as for typical *merriami*. Found in Kern and Tulare Counties, California, at altitudes from 2,000 to 7,000 feet, Upper Sonoran and Transition Zones.

Gila Chipmunk; Cliff Chipmunk.—*Eutamias dorsalis dorsalis* (Baird). Plate XXIV.

A good-sized form with only one prominent dark stripe. Upperparts grizzled gray, blackish and tawny; median dark stripe brownish black to blackish, other dark stripes so faint as to be almost indistinguishable; light stripes only faintly defined, mixed with general color of upperparts; facial stripes and small ear patch well-defined light gray; sides of neck and body tawny; tail above, mixed black, yellowish and white, below, ochraceous tawny banded with black and edged with white; underparts white. Total length, 9.5 inches; tail vertebræ, 4.3 inches; hind foot, 1.4 inches. Found in mountains of western New Mexico and of Arizona.

Utah Cliff Chipmunk.—*Eutamias dorsalis utahensis* Merriam. Resembling typical *dorsalis* but smaller, paler, and with less black in dorsal stripe. Color pattern subdued as in typical *dorsalis*, stripes inconspicuous, three dark stripes and four light ones discernible; upperparts mixed gray and buff; sides tawny; underside of tail fulvous; underparts white. Total length, 9 inches; tail vertebræ, 4.1 inches; hind foot, 1.3 inches. Found in "Utah, eastern Nevada, northern Arizona, and northwestern Colorado, in the Upper Sonoran and Transition Zones." (Warren)

Amœnus Group

Klamath Chipmunk.—*Eutamias amœnus amœnus* (Allen).

A conspicuously striped form with rich coloration. Five dark and four light stripes well defined; three inner dark stripes black, sprinkled with rufous, outer pair of dark stripes much shorter and mixed with color of sides; inner pair of light stripes grizzled grayish, outer pair white; facial stripes conspicuous; ears small, ear patch dull gray; crown of head mixed gray, rufous, and black; sides warm rufous (richest in summer pelage); feet washed with tawny; tail above, mixed black and warm buff, below, ochraceous black and warm buff; underparts whitish, more or less suffused with warm buff. Total length, 8.5 inches; tail vertebræ, 3.8 inches; hind foot, 1.3 inches. Found in Transition and Boreal Zones from northwestern California north through central and eastern Oregon and Washington. Plate XXIV.

Ochraceous Chipmunk.—*Eutamias amoenus ochraceus* Howell.
Larger than typical *amoenus*, more ochraceous above, particularly on head and rump, less blackish in dorsal stripes, tail paler above and below. Found "only in the Siskiyou Mountain region of northern California and southern Oregon. . . ." (Howell)

Mono Chipmunk.—*Eutamias amoenus monoensis* Grinnell and Storer.

Resembling typical *amoenus* but general tone paler and grayer, light-colored stripes whiter; size as in typical *amoenus*. Found "on the arid crest and east wall of the central Sierra Nevada [California], where it is characteristic of the Canadian Zone." (Grinnell)

Buff-bellied Chipmunk.—*Eutamias amoenus luteiventris* (Allen).

Very similar in size and proportions to typical *amoenus* and colored very much like it; underparts with strong suffusion of ochraceous buff. Found in Transition and Canadian Zones from southern Alberta south into Montana and Wyoming.

Bitterroot Valley Chipmunk.—*Eutamias amoenus vallicola* Howell.

Resembling *luteiventris*, "but averaging paler throughout, especially the head, upperparts of body and under surface of tail." Total length, 8.8 inches; tail vertebrae, 4 inches; hind foot, 1.3 inches. "This subspecies is apparently confined to the Bitterroot Valley [Montana] and the adjacent foothills, but the exact limits of its range are not known." (Howell)

Gray-tailed Chipmunk.—*Eutamias amoenus canicaudus* (Merriam).

Resembling *luteiventris* but with tail edged with gray rather than buff; with broad, conspicuous stripes and general tone of upperparts vinaceous gray. Total length, 9.2 inches; tail vertebrae, 4.2 inches; hind foot, 1.32 inches. Found in Transition Zone of eastern Washington.

Columbian Chipmunk.—*Eutamias amoenus affinis* (Allen).

Closely resembling typical *amoenus* and superficially very similar to typical *quadrivittatus*. This subspecies is given in Howell's list of the forms of *Eutamias*, but I can discern no describable external differences between it and typical *amoenus*. Found in Transition and Canadian Zones of southern British Columbia.

Hollister Chipmunk.—*Eutamias amoenus ludibundus* (Hollister).

"A large member of the *amoenus* group, nearest . . . to *luteiventris*, but with sides of quite a different tint; darker and more tawny, less bright and yellowish. Underparts about the yellowish color of *luteiventris*; tail darker beneath." (Hollister) Total length, 8.6 inches; tail vertebrae, 3.8 inches, hind foot, 1.36 inches. "Found along the

boundary line region between Alberta and British Columbia.

Mt. Baker Chipmunk.—*Eutamias amoenus felix* (Rhoads).

Resembling *luteiventris* but darker in color, with heavier suffusion of ochraceous on sides, cheeks, and underside of tail; broad, heavy, black stripes; much rusty brown on upperparts. Total length, 9.8 inches; tail vertebræ, 4.2 inches; hind foot, 1.3 inches. Found in the Mt. Baker Range, British Columbia.

Olympic Chipmunk.—*Eutamias amoenus caurinus* (Merriam).

Resembling typical *amoenus* but darker and with larger hind foot; ear patch reduced; dark stripes broad and black. Total length, 8.4 inches; tail vertebræ, 3.4 inches; hind foot, 1.36 inches. Found in Olympic Mountains, Washington, up to timber-line.

Panamint Chipmunk.—*Eutamias panamintinus* (Merriam).

A medium-sized species with bright, warm coloration resembling *speciosus* superficially. Dark stripes, five in number, chestnut, median stripes with some admixture of black, outer pair merging into ochraceous suffusion of sides; inner light stripes grizzled gray, outer pair whitish; small ear patch gray; facial stripes weak; feet and edging of tail ochraceous buff; underside of tail tawny; underparts white. Total length, 8.3 inches; tail vertebræ, 3.8 inches; hind foot, 1.28 inches. Found in the Panamint Mountains, Inyo County, California.

Minimus Group

Characterized by small size, and in most of the forms by bright color pattern, and well-defined dorsal stripes.

Least Chipmunk.—*Eutamias minimus minimus* (Bachman).

Size small; striping distinct; colors pale. Upperparts grizzled sandy gray washed with ochraceous buff on sides; dark stripes well defined, mixed rufous and brownish black; inner light stripes sandy gray, outer pair white; ear patch small, inconspicuous, whitish; facial stripes moderately developed; feet grayish; tail above, black and ochraceous buff, below, ochraceous buff fringed with black and ochraceous buff; underparts white. Total length, 7.2 inches; tail vertebræ, 3.2 inches; hind foot, 1.18 inches. Found on plains and Sonoran plateaus in Wyoming, northeastern Utah, and northwestern Colorado. Plate XXIV.

Painted Chipmunk; Sagebrush Chipmunk.—*Eutamias minimus pictus* (Allen). Plate XXIV.

Resembling typical *minimus* but slightly larger in size, darker in color, and more heavily striped. Upperparts gray, mixed whitish, buffy and blackish; dark stripes blackish to very dark brown; sides lightly washed with warm buff; underside of tail warm buff, fringed with cream color. Total length, 8 inches; tail vertebræ, 3.6 inches; hind foot, 1.2 inches. Found on sagebrush plains of eastern

Washington, Oregon, Idaho, northeastern California, Nevada, Wyoming, and Utah.

Coulee Chipmunk.—*Eutamias minimus grisescens* Howell.

Resembling *pictus* but smaller and grayer, with less buffy, inner pair of light dorsal stripes broader, tail paler and grayer. Total length, 7 inches; tail vertebræ, 3.2 inches; hind foot, 1.1 inches. Found in the "Coulee" region, east of Columbia River, Douglas and Grant Counties, Washington.

Cary Chipmunk.—*Eutamias minimus caryi* Merriam.

Resembling typical *minimus* but paler and grayer. In winter pelage pale, clear gray on neck, rump, flanks, and inner pair of light dorsal stripes; dark stripes with less dark brown; white ear patch fairly conspicuous. Total length, 7.6 inches; tail vertebræ, 1.6 inches; hind foot, 1.2 inches. Found in San Luis Valley, Costilla County, Colorado.

Pale Chipmunk.—*Eutamias minimus pallidus* (Allen).

Similar to typical *minimus* in size but slightly paler. Color pattern very like that of typical *minimus*, but flanks a lighter shade of buff and upperparts grayish with very little admixture of buffy. Total length, 8 inches; tail vertebræ, 3.6 inches; hind foot, 1.24 inches. Found in Montana and Wyoming in Great Plains region.

Bad Lands Chipmunk.—*Eutamias minimus cacodemus* (Cary)

Palest of the genus *Eutamias*. In summer pelage resembling *pallidus*, but even paler. Dark stripes ochraceous buff, median stripe darker but not black; upperparts pale grizzled gray washed with buff on sides; ear patch inconspicuous, whitish; tail above, black and whitish, below, cream color, the hairs banded with black and tipped with whitish; underparts white. Total length, 8.6 inches; tail vertebræ, 4.2 inches; hind foot, 1.3 inches. Found in the Big Bad Lands of southwestern South Dakota and the Hat Creek Basin Bad Lands of extreme northwestern Nebraska.

Wasatch Chipmunk.—*Eutamias minimus consobrinus* (Allen).

Much darker than typical *minimus* which it resembles in size. Upperparts mixed dusky rufous and gray; sides bright rufous; dark dorsal stripes black, outer stripes black, sprinkled with rufous; inner light stripes grizzled gray, outer pair whitish; ear patch small, grayish white; tail below, rufous, fringed with ochraceous buff. Total length, 7.6 inches; tail vertebræ, 3.4 inches; hind foot, 1.2 inches. Found in northwestern New Mexico, western Colorado, and eastern Utah in mountains and plateaus of Canadian and Transition Zones.

Bighorn Chipmunk.—*Eutamias minimus confinis* Howell.

Larger than *consobrinus* but similar to it in color; in summer pelage, dark dorsal stripes less blackish, more buffy on thighs; in winter more buffy on upperparts. Total length, 8.2 inches; tail vertebræ, 3.6 inches; hind foot, 1.32 inches. Found in the Bighorn Mountains of Wyoming.

Colorado Chipmunk.—*Eutamias minimus operarius* (Merriam).

Very similar to *consobrinus* and also somewhat resembling typical *maenus*. Dorsal stripes broad and conspicuous; inner dark stripes blackish, outer pair blackish, mixed with rufous; inner light stripes grizzled gray, outer pair white; rest of upperparts mixed gray, blackish and fulvous; sides washed with fulvous; small ear patch gray; tail below, rufous, fringed with ochraceous buff. Easily confused with *quadrivittatus* from which it may be distinguished by smaller size, proportionally longer tail and grayish rump. Total length, 8 inches; tail vertebræ, 3.7 inches; hind foot, 1.24 inches. Found in Colorado; chiefly east of Continental Divide from foothills to timber-line.

Sacramento Mountain Chipmunk.—*Eutamias minimus atristriatus* (Bailey).

Resembling *operarius* but somewhat larger and darker. Dorsal stripes broad, five black stripes, two rusty and two buffy whitish; sides dull grayish fulvous; abdomen with yellowish tinge. Total length, 8.5 inches; tail vertebræ, 3.8 inches; hind foot, 1.28 inches. Found in the Sacramento Mountains, Lincoln County, New Mexico.

Arizona Chipmunk.—*Eutamias minimus arizonensis* Howell.

"Similar in size and cranial characters to *Eutamias minimus atristriatus*; nearest in color to *E. minimus consobrinus*, but general tone more grayish (less tawny), the shoulders frequently washed with pale smoke-gray (as in *Eutamias cinereicollis*); tail more bushy and color of undersurface brighter tawny (about as in *operarius*)."

(Howell) Total length, 8 inches; tail vertebræ, 3.8 inches; hind foot, 1.2 inches. Found in the White Mountains and Prieto Plateau of eastern Arizona.

Timber-line Chipmunk.—*Eutamias minimus oreocetes* (Merriam).

In spring pelage, somewhat resembling typical *minimus*. Upperparts gray, washed with buffy yellow on sides of neck and body; ear patch whitish; mid-dorsal stripe black, outer dark dorsal stripes blackish and rusty; inner light stripes whitish, outer white; feet whitish; tail below, pale fulvous, banded with black, edged with ochraceous buff. Total length, 8 inches; tail vertebræ, 3.6 inches; hind foot, 1.24 inches. Found near timber-line in mountains of Montana and Wyoming.

Northern Chipmunk.—*Eutamias minimus borealis* (Allen).

About the size of typical *minimus* but darker in color. Upperparts mixed tawny, and gray; sides clear tawny, median stripe blackish, other four dark stripes dark brown to blackish, mixed with rufous; inner light stripes grizzled gray, outer white; tail below, ochraceous, fringed with ochraceous buff; underparts white, with light buffy tinge in some specimens. Total length, 8.2 inches; tail vertebræ, 3.8 inches; hind foot, 1.28 inches. Found in forests, east

of the Rockies, from North Dakota, South Dakota, and Montana north to Mackenzie, Canada.

Eutamias minimus neglectus = *Eutamias minimus borealis*, according to Howell.

Gray-headed Chipmunk.—*Eutamias minimus caniceps* (Os-good).

Resembling *borealis* but grayer, ear patch more conspicuous, underparts clear white. Dark dorsal stripes black and conspicuous, outer pair with some ochraceous mixture; outer light stripes white, inner gray; top of head grayish; sides ochraceous; feet yellowish white; tail below, clay color, edged with gray; underparts white. Total length, 8.8 inches; tail vertebræ, 4 inches; hind foot, 1.18 inches. Found from headwaters of the Yukon, Lake Lebarge, south into British Columbia.

Lake Superior Chipmunk.—*Eutamias minimus jacksoni* Howell.

Resembling *borealis* "but upperparts and tail more intensely tawny; head and facial stripes slightly darker; median pair of dorsal stripes more strongly tinged with sayal brown; tail darker, both above and below." (Howell) Total length, 8.4 inches; tail vertebræ, 3.6 inches; hind foot, 1.32 inches. Found in northern Wisconsin, Minnesota, and Michigan northward into western Ontario and east as far as Nepigon.

Alpinus Group

Alpine Chipmunk.—*Eutamias alpinus* (Merriam).

A small, pale, gray species. Upperparts pale ashy gray, with faint suffusion of buff on shoulders and sides; median stripe pale rusty, with some dusky admixture, outer dark stripes rusty, not very long or conspicuous; inner light stripes narrow, grayish, outer pair broader and whiter; facial stripes well defined but not prominent; small ear patch whitish; feet gray; tail above, mixed black and gray to yellowish, below, clay color and black, edged with gray to yellowish; underparts white. Total length, 7.6 inches; tail vertebræ, 3.4 inches; hind foot, 1.2 inches. Found only in the Boreal Zone of the southern Sierra Nevada, California, Tulare County to Inyo County.

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The Chipmunks of the genus *Eutamias* are confined in their distribution to the western half of North America. Some of the forms reach as far east as Lake Superior and Lake Huron, but the greatest number of species are found in the Rocky Mountain region and thence westward. In eastern North America the genus *Tamias* seems to take the place of *Eutamias*, but although members of both genera go by the name of Chip-

munk and have a rather close superficial resemblance, there is, nevertheless, quite a distinction between the Western and Eastern Chipmunks. The fine striping and slender, more agile build of a typical Western Chipmunk readily distinguishes it from the broader striped, heavier bodied *Tamias*, which in many characters more nearly resembles some of the small western Ground Squirrels (*Callospermophilus*).

The Western Chipmunks are a large and much diversified group. In the terminology of the mammalogist, they are said to be very plastic; that is, there seems to be a distinct type of Chipmunk for each change of environment; and one rather widely accepted explanation for this is, that the influences of the environment find the Chipmunk to be an easily moulded organism and have modified its characters. Regardless of whether one believes that animals are directly influenced by environmental forces or not, no mammalogist can deny that there is a close correlation between the color pattern of *Eutamias* and the type of country where it is found.

In the humid, heavily forested, coastal belt of southern British Columbia, Washington, Oregon, and California, we find the largest and most somber colored of all the Chipmunks, the *townsendii* group. Here the large size is correlated with an abundant food supply and congenial environment, and the dark color with the humidity of the atmosphere. At the other extreme stands the *minimus* group, living in the open, sun-flooded, arid plains and deserts and well characterized by small size and pale colors. The difference in the appearance of the members of these two groups fully equals the contrast between their respective environments. The gap between the small, pale Chipmunks and the large, dark Chipmunks is bridged over by many variations in size and color pattern. There is scarcely any peculiar ecological association in western North America which does not have its own peculiar form of Chipmunk, provided the animal can find food there. This accounts for the great number of known species and subspecies which, however they vary, are yet easily recognized as members of the genus *Eutamias*.

Wherever it is found, the Chipmunk is a bright, alert, active creature moving about during most of the daylight hours and, in most cases, easily observed. In general, the species which live on the open plains are shyest, since they are most liable

to attack and can not afford to take chances where the hazards of the terrain are against them. On the other hand, the forest-dwelling species, with avenues of escape at every turn, are often bold, curious, and easily approached. They are also most often heard calling or chattering.

The call-note of the Western Chipmunk does not vary greatly throughout the genus and the observer has no difficulty in recognizing it whether he has ever seen that particular species before or not. The alarm note is a sharp, high-pitched chirp, generally given as a single note which may be frequently repeated. In cases of extreme alarm the note may be repeated so rapidly as to almost run the syllables together. Usually there is some distinction between a scolding chirp and one indicating unrestrained terror. Chipmunks call at the appearance of an enemy, such as a hawk or man, and when chasing one another. When a Chipmunk calls from some vantage point,—a log, stump, or top of a bush,—the vocal effort is accompanied by a nervous and energetic twitch of the tail.

The tail is habitually carried more or less extended and not curved over the back, as sometimes in the arboreal Squirrels. When the animal is undisturbed and moving slowly, the tail is slightly curved and extended, or at right angles to the body; when he stops or sits up to eat, it may be drawn in a closer curve at the side or toward the back. Some of the plains Chipmunks carry the tail straight up at right angles when fleeing in alarm.

Chipmunks tame easily and make interesting pets. In places where they come into contact with man and are not molested, they very soon learn that they have little to fear, and allow a very close approach.

In most regions Chipmunks find an abundance of food in seeds, berries, nuts, buds, etc., and during the warm months of the year need not search long for a meal. They store food in the internal cheek-pocket and carry it to burrows or holes in the rocks, sometimes with such a quantity in the side of the face as to cause a very obvious swelling.

The Chipmunk makes its nest underground, burrowing into the earth at the foot of a stump or beside a rock or log, and is terrestrial in habit, although it climbs readily when pressed by an enemy, and sometimes climbs up a short distance on

tree trunks from choice. When feeding it often climbs shrubs for fruit or nuts.

It is active much of the year and even in the cold parts of its range may sometimes be seen on bright sunny days in winter. Hibernation does not seem to be as complete as with the Eastern Chipmunk. In its southern range it is above ground every day in the year.

The Chipmunk assumes two, sometimes three, very distinct pelages in the course of the year. The brightest pelage is that of the breeding season which appears (depending upon the locality where the species lives), in April, May, or June. This coat is followed by the post-breeding or summer pelage which usually lacks some of the intensity of the late-spring or early summer coat. Finally, in October or November, appears the winter pelage, generally the most subdued of the annual color patterns. The winter pelage is very worn and ragged in appearance before it is replaced by the new fur of the breeding season. Not infrequently there is enough difference between the worn winter and the fresh breeding pelages to make the same animal look like two distinct forms. Most of the descriptions given in this account are those of summer pelages, unless otherwise specified, but lack of space does not allow the listing in detail of these different patterns for so many subspecies.

Chipmunks have only one litter of young a year, as nearly as I can gather from personal observation and records, and if there is any significance in the assumption of a distinct breeding pelage we should expect no more than one litter annually. While conditions are such that no more than a single litter could be raised in a northern summer, there is no hindrance to prevent the successful raising of more than one litter in the Chipmunks' southern range where other rodents have several litters annually. The average number of young in a litter is four to six.

Chipmunks are subject to various parasites and I have found them infested with ticks, the larvæ of the bot-fly, and internally with the threadworm.

Genus **Tamias**

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars $\frac{8}{8}$ = 20.

Eastern Chipmunk.—*Tamias striatus*

and related forms

Names.—Chipmunk; Common Chipmunk; Eastern Chipmunk; Chipping Squirrel; Hackee. Plate XXIV.

General Description.—A small, terrestrial Squirrel, with conspicuous dorsal stripes; flattened and hairy tail; well-developed cheek-pouches; alert, nervous behavior; and high-pitched, jerky call-note. Head rounded, ears prominent but short and rounded.

Color.—Sexes alike in color; some seasonal variation.

Upperparts.—Summer: Grizzled rusty red to reddish brown from nose to rump, clearest and brightest on rump; five black-



FIG. 53. Eastern Chipmunk

ish stripes extending from shoulders to rump, arranged as follows: a black median stripe running from between ears almost to root of tail, most conspicuous from shoulders to hips; on either side of the median stripe is a narrow band of the grizzled reddish or chestnut body color; then on either side are two dark stripes, shoulders to hips, separated by a light-colored stripe, bright buffy to whitish. While these dark and light stripes are brilliantly conspicuous along most of their extent, they fade away more gradually into the body color of the neck and shoulders and rump. Upside of tail similar to back, the hairs banded with black and tipped

with whitish or yellowish; ochraceous or buffy stripes above and below the eye and a dark stripe passing through eye; flanks and sides tawny brown or chestnut; hands and feet ochraceous to tawny.

Underparts.—Much lighter colored than above, generally whitish, sometimes with suffusion of buffy or ochraceous; underside of tail rufous, bordered laterally with blackish and fringed with gray.

Winter pelage duller and darker, with less reddish on upperparts.

Young.—Like adults but colors less contrasting.

Measurements.—Total length, 9 to 10 inches; tail vertebræ 3.5 to 4 inches; hind foot, 1.4 inches.

Geographical Distribution.—Eastern North America from latitude 49° through northern Illinois, Wisconsin, Minnesota, Michigan, Iowa, and eastward to the Atlantic; south to about latitude 34°.

Food.—A great variety of seeds, grains, nuts, acorns, berries, etc., but including some animal food such as insects, birds' eggs, and young Mice.

Enemies.—Snakes, Hawks, Weasels, Foxes, Wildcats, Badgers, and other small carnivores.

Species and Subspecies of the Genus *Tamias*

Eastern Chipmunk.—*Tamias striatus striatus* (Linnæus).

As just described, found on the Atlantic seaboard from Georgia north to southern Virginia and Ohio.

Gray Eastern Chipmunk.—*Tamias striatus griseus* Mearns.

Larger, grayer than typical *striatus*, and with more subdued color pattern. Total length, 10.9 inches; tail vertebræ, 4 inches; hind foot, 1.46 inches. Found west of the Great Lakes, in the upper Mississippi Valley.

Lyster Chipmunk.—*Tamias striatus lysteri* (Richardson).

Noticeably paler than typical *striatus*, with rump bright yellowish red. Total length, 9 inches; tail vertebræ, 3.4 inches; hind foot, 1.36 inches. Found in region from 50° north latitude south to northern New York and west to Ontario and Michigan. Plate XXII.

Bangs Chipmunk.—*Tamias striatus venustus* Bangs.

Dorsal stripes shorter, but colors brighter and more intense than in typical *striatus*. Total length, 10.5 inches; tail vertebræ, 4 inches; hind foot, 1.5 inches. Found in the extreme southwestern limits of the range of the *striatus* group, Oklahoma.

Fisher Chipmunk.—*Tamias striatus fisheri* Howell.

Paler and grayer than typical *striatus*, smaller than *griseus*, intermediate in color between *striatus* and *lysteri*. Total length, 10 inches; tail vertebrae, 3.6 inches; hind foot, 1.4 inches. Found in the "Middle Atlantic States from the lower Hudson Valley, New York, south to southern Virginia and extreme eastern Kentucky, and west to Ohio." (Howell)

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The Eastern Chipmunk is one of the best known of our small eastern mammals and is familiar to every farmer's boy and to every hunter and man who lives an out-of-door existence. Its bright coloration, alert, active behavior, and shrill, chirping call-note readily set it apart from any other eastern Squirrel. In the western United States, some of the small Ground Squirrels look very much like the Eastern Chipmunk, but differ sufficiently in detail (see Say Ground Squirrel, page 197) to be recognized as distinct animals.

The Common Chipmunk, while a true Squirrel, belongs to the section of the Squirrels which spend most or all of their existence on the ground, living in holes in the earth, as distinguished from the Squirrels which live in the tree-tops. It is perhaps not as far advanced in its terrestrial habits as the western Ground Squirrels, and climbs up stumps and trees on occasion. It has been seen at considerable heights feeding in beech or elm trees, and when seeking refuge from a Dog climbs freely, although it is by no means as capable in this respect as is the Red Squirrel.

The Chipmunk has an inquisitive disposition and is very apt to linger on the verge of safety to scold and chatter at an intruder. The commonest alarm note is a shrill, chirping whistle, which is accompanied by twitches of the tail or jerkings of the body. When not disturbed the Chipmunk has a distinctive call, a "chuck" or "cluck."

The Eastern Chipmunk goes into complete hibernation when cold weather sets in and spends the winter curled up in a ball in its nest underground. The time for the winter disappearance varies with different regions and with the severity of each particular season. An average time would be from September to October, and the time of reappearance March to April. This animal does not become excessively fat in the autumn as do most hibernating mammals.

The number of young in a litter is from four to five, and I have seen no records of more than the one brood a year.

Genus **Sciurus**. Tree Squirrels

Subgenus **Tamiasciurus**¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{8}{8}$ = 22.

Red Squirrel.—**Sciurus hudsonicus**

and related forms

Names.—Red Squirrel; Pine Squirrel; Chickaree. Plate XXV.

General Description.—A small, arboreal Squirrel with flat, bushy tail; fairly long ears; no internal cheek-pockets; incisors narrow; rudimentary first upper premolar generally present, but sometimes absent; inner toe on forefoot very small; pelage fairly long and soft, but not silky; manner alert; diurnal in habit.

Color.—Sexes colored alike; a marked seasonal variation.

Upperparts (winter).—Rusty red from top of head to tail; sides olive-gray, lightly sprinkled with black; ears tufted with dusky hairs; tail above, yellowish rufous, the hairs banded near the tips with black and fringed with pale yellowish rufous, below, yellowish gray banded and fringed much as above, tip with a broad, subterminal bar of black.

Underparts.—Hairs slaty at base, washed with grayish white and tipped with black.

Summer.—Above, pale rusty red, brightest on outer sides of legs and feet; a narrow, black, lateral line; ears without tufts; tail less buffy than in winter, but colored much the same; underparts clear white.

Immature duller than adults.

Measurements.—Sexes of equal size. Total length, 12.5 inches; tail vertebræ, 4.6 inches; hind foot, 1.9 inches.

Geographical Distribution.—Most of forested North America.

Food.—Nuts, seeds, buds, berries, some insects and animal food such as birds' eggs and fledglings.

¹ For a revision of this subgenus see J. A. Allen, Bulletin Amer. Mus. Nat. Hist., Vol. X, pp. 249-298, 1898.

Enemies.—Hawks, Owls, Pine Martens, Foxes, Wildcats, and other small carnivores.

Species and Subspecies of the Subgenus *Tamiasciurus*

The Chickarees are fairly constant in general pattern of coloration, although the different forms vary in color, shade or minor details of pattern. The Chickarees are the smallest of the tree-climbing, diurnal Squirrels.

Hudsonicus Group

Characterized by white underparts and yellow-fringed tail. Members of this group occur in two color phases, the common rufous phase and a rarer olivaceous phase.

Northern Red Squirrel.—*Sciurus hudsonicus hudsonicus* (Erxleben).

As described above. Found in "Cold Temperate subregion east of the Rocky Mountains [Hudsonian zone]." (Miller)

Bangs Red Squirrel.—*Sciurus hudsonicus gymniscus* Bangs.

Size small; color dark. Upperparts, in winter, rich rusty red; sides olive-gray; underparts gray, sprinkled with black. Summer pelage duller red above; black lateral line present; underparts clear white. Total length, 12 inches; tail vertebræ, 4.8 inches; hind foot, 1.8 inches. Found in the spruce belt of eastern North America, south of Labrador—northern New York, northern New Hampshire, northern Maine, New Brunswick, Nova Scotia, Quebec, Ontario, northern Michigan and northern Minnesota.

Southern Red Squirrel.—*Sciurus hudsonicus loquax* Bangs.

Resembling typical *hudsonicus* but redder and brighter above in summer and winter. Underparts with less black-tipped hairs in winter. Tail with less black. Total length, 13 inches; tail vertebræ, 5.2 inches; hind foot, 1.9 inches. Found in "Alleghenian and Carolinian Faunæ of the Humid Province." (Allen)

Minnesota Red Squirrel.—*Sciurus hudsonicus minnesota* Allen.

Largest of the eastern Red Squirrels; coloration rather lighter than *loquax*. Total length, 13.8 inches; tail vertebræ, 5.7 inches; hind foot, 2 inches. Found in "Minnesota and Wisconsin, and probably Iowa, and eastward to northern Indiana." (Allen)

Black Hills Red Squirrel.—*Sciurus hudsonicus dakotensis* Allen.

Larger and paler than typical *hudsonicus*. Upperparts light yellowish rufous in winter, pale yellowish olivaceous gray in summer. Total length, 14 inches; tail vertebræ,

5.8 inches; hind foot, 2 inches. Found in "The Black Hills of South Dakota and adjoining portions of Wyoming." (Allen).

Bailey Red Squirrel.—*Sciurus hudsonicus baileyi* Allen.

Size large; resembling typical *hudsonicus* but darker and more olivaceous above in summer, and with underparts washed with pale fulvous. Total length, 13.6 inches; tail vertebræ, 5.6 inches; hind foot, 2 inches. Found in "Outlying mountain ranges of central Wyoming and eastern Montana, and northward into Alberta in the eastern foothills of the Rocky Mountains. Its range includes the Bighorn, Pryor and Laramie Mountains in Wyoming, and the Big Snowy, Bear Paw, and Little Rocky Mountains in Montana, and probably other outlying, pine-covered buttes and hills." (Allen)

Wind River Mountains Red Squirrel.—*Sciurus hudsonicus ventorum* Allen.

Resembling *baileyi* but darker and more olivaceous above, with more black on upperside of tail and more gray on underside of tail; underparts grayer and without fulvous suffusion. Upperparts, in winter, dark rusty red along back, sides gray, suffused with pale yellowish; in summer dark olivaceous, with rusty wash on outer sides of limbs; tail with fairly broad subterminal band of black. Total length, 13.2 inches; tail vertebræ, 5.4 inches; hind foot, 2 inches. Found in "Wind River Mountains region and northward along the eastern base of the Rocky Mountains to at least Mystic Lake, and probably to the Belt ranges east of Helena, and thence westward to the head of the Snake River in Idaho, and south along the Idaho and Wyoming boundary to the Wasatch Mountains in northeastern Utah." (Allen).

Richardson Red Squirrel.—*Sciurus hudsonicus richardsoni* (Bachman).

Size large; much black on upper surface of tail; color of upperparts dark; black subterminal bar on tail broad. Winter.—Chestnut, sprinkled with black on back, sides and limbs brownish gray; about half (terminal) of tail black; underparts white, sprinkled lightly with black. Summer.—Mixed rusty red and olivaceous; rusty red on feet and legs; conspicuous black lateral line; underparts clear white; tail above, rusty red on central area for half to two-thirds of length, then black fringed with yellowish. Total length, 13.5 inches; tail vertebræ, 5.4 inches; hind foot, 2.4 inches. Found in "The Bitterroot and Cœur d'Alene Mountains on the western border of Montana; the Lost River; Salmon River, Pahsimeroi and Saw Tooth Mountains in central Idaho, and westward in the Craig and Seven Devils Mountains to the Powder River and Blue Mountains of Oregon; thence through northern Idaho, and west in the mountains of northeastern Washington to Colville, and northward

into the Kootenai District of eastern British Columbia." (Allen)

Streator Red Squirrel.—*Sciurus hudsonicus streatori* Allen.

Resembling *richardsoni*, but with less black on tail and more olivaceous above in summer; tail shorter. Total length, 13 inches; tail vertebræ, 5 inches; hind foot, 2.4 inches. Found in "Central part of northern Washington, from the Columbia River northward over central British Columbia. It occupies the Okanagan District of Washington, from the head of Lake Chelan northward." (Allen)

Vancouver Red Squirrel.—*Sciurus hudsonicus vancouverensis* Allen.

Resembling *streatori* but smaller and with underparts washed with brownish (winter) or yellowish (summer), otherwise colored much as in *streatori*. Total length, 12.3 inches; tail vertebræ, 4.8 inches; hind foot, 2 inches. Found on "Vancouver Island, and the coast region of northern British Columbia, north at least to Sitka." (Allen)

Kupreanof Red Squirrel.—*Sciurus hudsonicus picatus* Swarth.

Resembling *vancouverensis* but brighter in color and with less black at tip of tail. Winter.—Upperparts bright chestnut, with hazel dorsal band; center of tail on underside reddish. Total length, 12.5 inches; tail vertebræ, 5 inches; hind foot, 2 inches. Found in the Sitkan district of Alaska and southward; also on Kupreanof Island and adjacent islands south of Revillagigedo Island.

Alaska Red Squirrel.—*Sciurus hudsonicus petulans* Osgood.

Larger and darker than typical *hudsonicus*; redder than *streatori*; paler than *vancouverensis*. Upperparts (summer) near raw umber; sharply defined, black, lateral line; black in tail restricted, tail fringed with ochraceous; underparts with yellowish wash. Winter pelage like that of typical *hudsonicus* but darker, tail blacker. Total length, 12.1 inches; tail vertebræ, 4.8 inches; hind foot, 2 inches. Found in the vicinity of White Pass, Alaska, limits of range unknown.

Douglasii Group

Characterized by rusty reddish underparts and tail fringed with yellowish or white; found west of the Rocky Mountains.

Douglas Chickaree.—*Sciurus douglasii douglasii* Bachman.

Size about as in *hudsonicus*. Winter.—Dark rusty red along back; sides and limbs dark brownish gray; dusky lateral line may or may not be present; tail above, for two-thirds its length, like back, mixed with black and fringed with yellowish; black subterminal band broad; underparts buffy gray to orange, mixed with black; central zone of tail on underside mixed rusty and black; ear tufts blackish.

Summer.—Back dark olive-brown tinged with reddish; an intensely black lateral line; underparts and feet orange. Total length, 12.6 inches; tail vertebræ, 5 inches; hind foot, 2 inches. Found in "The immediate vicinity of the Pacific coast in Oregon and Washington, from about Cape Blanco to Juan de Fuca Strait." (Allen) Plate XXV.

Redwood Chickaree.—*Sciurus douglasii mollipilosus* (Audubon and Bachman).

Resembling typical *douglasii* but in winter less dark above and sides grayer; tail fringed with whitish instead of yellowish; underparts generally paler; in summer more olivaceous above and less rusty red, underparts paler and tail fringed with white. Total length, 12.6 inches; tail vertebræ, 5.4 inches; hind foot, 2 inches. Found in "Pacific coast region of northern California, west of the Coast Range, from Sonoma County (Petaluma) north into Curry County (Port Orford), Oregon." (Allen)

Cascades Chickaree.—*Sciurus douglasii cascadiensis* Allen. Very similar to *mollipilosus*, having white-fringed tail; practically indistinguishable from it in winter pelage; in summer more olivaceous above and less deeply orange below. Total length, 13 inches; tail vertebræ, 5.4 inches; hind foot, 2 inches. Found in "The Cascades region of Oregon and Washington, north into British Columbia, including also the coast region at the mouth of the Fraser River, and north at least to Rivers Inlet (about 51° 30'), some fifty miles north of Vancouver Island. In Oregon this form prevails south in the Cascades to the vicinity of Fort Klamath; and, west of the Cascades, to Glendale, Cleveland, Eugene, and Sweet Home, and in Washington, to Tenino, Roy, and Snoqualmie Falls." (Allen)

California Chickaree.—*Sciurus douglasii albolimbatus* Allen. Similar to *cascadiensis*; in winter slightly paler above, underparts grayish white without wash of fulvous, and very little sprinkling of black; in summer, almost indistinguishable from *cascadiensis*, but slightly grayer; underparts pale fulvous; feet and outer sides of limbs orange; tail fringed with pure white. Total length, 13.2 inches; tail vertebræ, 5.5 inches; hind foot, 2.1 inches. Found in "The Sierra Nevada region of central and northern California, north in Oregon, east of the Cascades, to the Maury Mountains and Strawberry Butte, over which region it prevails with little change and may be considered typical, and nearly typical *albolimbatus* prevails westward in Oregon to the eastern base of the Cascades, where it passes into *cascadiensis*." (Allen)

Fremonti Group

Characterized by underparts always white and tail fringed with white; found in southern Rocky Mountain states.

Fremont Chickaree.—*Sciurus fremonti fremonti* Audubon and Bachman.

Similar to *hudsonicus* in size. Winter.—Upperparts gray, with pale, rusty yellowish suffusion along back and sprinkled with black; sides and limbs grayish, sprinkled with yellowish and black; dusky lateral line poorly defined; tail above, yellowish rusty mixed with black, the hairs banded with black and tipped with white; tip of tail black, fringed with white; underside of tail yellowish gray, banded with black, fringed with white; small, dusky ear tufts; underparts grayish white, sprinkled with dusky. Summer.—Above, yellowish gray; ochraceous on feet and limbs; a conspicuous black lateral line; tail much as in winter; underparts white to grayish. Total length, 13 inches; tail vertebræ, 5.2 inches; hind foot, 2 inches. Found in "The mountainous portions of Colorado, reaching the extreme southern border of Wyoming at Woods, P. O., and Uintah Mountains of Utah; also reaching the southern boundary of Wyoming at Fort Bridger." (Allen)

Taos Chickaree.—*Sciurus fremonti neomexicanus* Allen.

Resembling typical *fremonti* but brighter yellowish rufous above in winter. Total length, 12.8 inches; tail vertebræ, 5.3 inches; hind foot, 1.94 inches. Found in "Taos Range, New Mexico." (Allen)

White Mountains Chickaree.—*Sciurus fremonti lychnuchus* Stone and Rehn.

Resembling *neomexicanus* but larger and redder in color. Upperparts (summer) dull rusty red; sides paler; narrow lateral line poorly defined; underparts whitish. Total length, 14 inches; tail vertebræ, 5.6 inches; hind foot, 2.2 inches. Found in the White Mountains of Lincoln County, New Mexico..

Arizona Chickaree.—*Sciurus fremonti mogollonensis* (Mearns).

Colored much as in *neomexicanus* but larger. Total length, 14 inches; tail vertebræ, 5.7 inches; hind foot, 2.1 inches. Found in "The higher mountains and plateaus of central Arizona, from the Douglas fir belt to timber line." (Allen)

Mount Graham Chickaree.—*Sciurus fremonti grahamensis* (Allen).

Resembling *mogollonensis* but "yellowish and less rufescent above (in summer pelage), with the central area of the tail ochraceous above and nearly white below." Found in "The fir zone on the summit of Mt. Graham, Arizona." (Allen)

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The Chickaree or Red Squirrel is usually the commonest tree Squirrel of most regions where it occurs, although in some of the eastern states it is outnumbered by the Gray Squirrel. Its size and coloration, scolding chatter, and alert, inquisitive

behavior serve to distinguish it from its larger and more cautious relatives, the Gray and Fox Squirrels. Although Chickarees are found from coast to coast in practically every forested area, and vary to some extent in size, color, and other external characters, they do not change enough to conceal their true relationships and one may recognize the Chickaree for what he is wherever you find him.

Chickarees are forest Squirrels and are not found out of timbered areas. In some places these Squirrels may leave heavy forest and wander through scrub growths such as follow a water-course, but they are essentially denizens of evergreen forests.

These Squirrels are active throughout the year and if winter weather temporarily drives them into shelter they come out with the return of sunshine. Like most other Squirrels they are dependent upon a diet of plant and tree products such as nuts, seeds, buds, etc., and store up part of the food they find in times of abundance for the winter season. It has been stated that the Chickaree may be an important reforestation agent because of this habit, since seeds of forest trees which the animal fails to dig up will sprout when conditions are favorable. The Douglas Fir is one of the trees which gains more than it loses by the presence of Squirrels, strange as this may seem. In other sections, Red Squirrels may dig up seed which has been set out for reforestation purposes and become a decided economic pest.

Red Squirrels are diurnal and do not move about at night. They have several distinctive calls, a harsh, scolding, continuous chatter, or whicker, when an enemy is in plain sight, and a loud call, not continuous but given once or twice and repeated at intervals, when the Squirrel is not greatly excited. The home nest is usually in a tree cavity, a decayed hollow, or an old Woodpecker's nest, or is built of twigs and leaves upon some convenient crotch in the limbs. Chickarees are good swimmers and have been known to cross bodies of water a mile in extent.

Red Squirrels have gained an unsavory reputation as robbers of birds' nests, suckers of eggs, and eaters of fledglings, and many naturalists have written accounts of how the animals were caught in the act. They appear to be the most carnivorous of our Squirrels.

EASTERN GRAY SQUIRREL

The unquenchable curiosity of these Squirrels makes them a conspicuous mammal. Upon the appearance of a man or a Dog they begin a violent harangue and scold and chatter for long periods of time. Instead of being shy and secretive, like most wild mammals, they attract attention and seem to feel that nothing on the ground will be able to catch them in the trees.

Four or five young form the average Red Squirrel litter and they are born in late spring, May to June. Only one litter is raised each season.

Subgenus *Sciurus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22.

Eastern Gray Squirrel.—*Sciurus carolinensis*

and related forms

Names.—Eastern Gray Squirrel; Gray Squirrel; Cat Squirrel. Plate XXV.

General Description.—A large, arboreal Squirrel with long, flat, bushy tail; ears usually without tufts; prevailing color of upperparts grayish.



FIG. 54. Gray Squirrel

Color.—Sexes colored alike; seasonal variation not conspicuous.

Upperparts.—Mixed gray and yellowish brown, head and back darker and with more of a brownish tinge than sides of limbs, neck, and rump which are grayish; ears yellowish white; hairs of tail yellowish at base, banded with black, tipped

with white, the general impression being blackish overlaid with white.

Underparts.—Whitish.

Immature much like adults, but with less yellowish brown.

Measurements.—Sexes of equal size. Total length, 18 inches; tail vertebræ, 8.5 inches; hind foot, 2.5 inches.

Geographical Distribution.—Forest parts of eastern North America from Florida to southern New Brunswick and Ontario; from Atlantic coast west to Minnesota (for *carolinensis* group).

Food.—Mainly of vegetable nature, such as nuts, fruits, buds, seeds, grains, etc., but some animal food such as insects and their larvæ, young birds, eggs, etc.

Enemies.—Hawks, Owls, Martens, Weasels, Lynxes and most of the active carnivores.

Species and Subspecies of the Subgenus *Sciurus*

Carolinensis Group—Eastern Gray Squirrels

Southern Gray Squirrel.—*Sciurus carolinensis carolinensis* Gmelin.

As described above; soles of feet usually naked; color pattern not very variable. Found in "Austral Zone, from northern Florida north about to the lower Hudson Valley, west through the Alleghenies south of Pennsylvania to Indiana, Missouri, Oklahoma, and the edge of the plains." (Miller)

Everglade Gray Squirrel.—*Sciurus carolinensis extimus* Bangs. Smallest of the Eastern Gray Squirrels; color lighter and grayer than typical *carolinensis*; small woolly tuft at base of ear sometimes present. Yellowish gray above with faint grizzling of blackish; ear tufts white. Total length, 17.5 inches; tail vertebræ, 7.6 inches; hind foot, 1.9 inches. Found in "Subtropical fauna of south Florida, northward about half way up the peninsula." (Miller)

Louisiana Gray Squirrel; Bayou Gray Squirrel.—*Sciurus carolinensis fuliginosus* (Bachman).

Larger than typical *carolinensis*; upperparts darker and richer in color; underparts never pure white. Upperparts deep yellowish rusty mixed with black; tail dark, fringed with white; ears with conspicuous woolly tufts at posterior base; underparts varying from grayish white to pronounced dark buffy. Total length, 19 inches; tail vertebræ, 9 inches; hind foot, 2.7 inches. Found in "The bayou region of the coast of Louisiana." (Miller)

Northern Gray Squirrel.—*Sciurus carolinensis leucotis* (Gapper).

Larger and grayer than typical *carolinensis*; apt to occur in black or melanistic phase; soles of feet may be hairy in winter. Upperparts, in winter, silvery gray with faint grizzling of yellowish brown and black; a faint wash of yellowish brown on head, back, and upper surfaces of hands and feet; underparts white. Summer pelage with more rusty brown, especially along sides. Melanistic phase, everywhere black; various degrees of intergradation between gray and black phases may occur. Total length, 20 inches; tail vertebræ, 9.2 inches; hind foot, 2.8 inches. Found in "Transition Zone and locally lower edge of Canadian Zone from the Alleghenies of Pennsylvania north through New York and New England, to southern New Brunswick and southern Ontario; west to Minnesota." (Miller)

Merriam Gray Squirrel.—*Sciurus carolinensis hypophæus* Merriam.

Resembling *leucotis* in size but darker above and less white below; soles of feet heavily furred in winter, naked in summer; ears tufted in winter. Upperparts, in winter, dark gray in tone, mixed white, yellowish brown and black; tail with much black, white tips to hairs narrow; ear tufts yellowish white; color of sides extends well onto underparts and only narrow streak down center is white. Total length, 20 inches; tail vertebræ, 8.8 inches; hind foot, 2.7 inches. Found in "The edge of the forest belt in Minnesota. Limits of range not known." (Miller)

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The Eastern Gray Squirrels are too well known to require special attention as to distinguishing characteristics. They are the common large Squirrel in most of the parks of the eastern cities and they have long been one of the popular game animals of the East. When not disturbed these animals become very tame, but where hunted they are wild and wary and hide at the first approach of danger.

Gray Squirrels are active only during the day. They store up food for the times when food will be difficult to find, and they do not hibernate although they may stay in the nest during periods of inclement winter weather. They are strictly tree-dwelling Squirrels and are not found away from forests. At times they become very abundant and when the food supply becomes scarce in a given region they move out in a great migration wave. In the early history of the East these migrations took on vast proportions and unbelievable numbers of Gray Squirrels hurried across the country,

swimming rivers and lakes and devastating any farms that lay in the path.

The Gray Squirrel builds a bulky nest of leaves and twigs in the crotch of a limb or else chooses a hollow in some rotted trunk. The young number from four to six and often two litters are raised a year. The first brood appears in March or April.

This Squirrel has several call-notes, a loud, husky bark and a whining whicker being the commonest. It is an excellent climber, racing through the trees and making long leaps when chasing one another or threatened by danger. It has an active, nervous temperament, although not to the same extent as the Red Squirrel.

Griseus Group.—Western Gray Squirrels

Western Gray Squirrel; California Gray Squirrel; Columbia

Gray Squirrel.—*Sciurus griseus griseus* Ord. Plate XXV.

Larger and grayer than the Eastern Gray Squirrels and with broader tail. Upperparts pale gray, finely speckled with white, sometimes with pale yellowish suffusion on back; ring about eye white; ears never tufted; tail very large and broad, hairs sometimes three inches long, color slate-gray tipped with white; underparts white. Total length, 22 inches; tail vertebræ, 11 inches; hind foot, 3.2 inches. Found in "Pine and oak forests of Transition (and upper border of Austral) Zone from extreme southwestern Washington through western Oregon and most of California (except coast belt south of San Francisco) to northern Lower California, Mexico." (Miller)

Black-footed Gray Squirrel.—*Sciurus griseus nigripes* (Bryant).

Much darker than typical *griseus*, with less white grizzling on upperparts, and more or less brownish suffusion; tail darker; upper surfaces of hands and feet slaty to blackish. Total length, 22.5 inches; tail vertebræ, 12 inches; hind foot, 3 inches. Found in the humid coast section of California from San Mateo County through Monterey County.

Anthony Gray Squirrel.—*Sciurus griseus anthonyi* (Mearns).

Paler in color than either typical *griseus* or *nigripes*. Upperparts gray with fine sprinkling of white; yellowish brown patch at base of ear; tail above blackish, edged with white, below grayish, banded with black, edged with white; hands and feet iron-gray; underparts white. Total length, 22 inches; tail vertebræ, 10 inches; hind foot, 3.1 inches. Found in the "Transition Zone of southern California, from near the Mexican boundary northwest to the mountains of Ventura County." (Grinnell)

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The Gray Squirrels of the *griseus* group are found in forested areas where conifers and oaks grow. Most of their food is derived from these trees in the shape of seeds. I have not seen any records to show that they are ever found in numbers to compare with the Eastern Gray Squirrels in the seasons of their greatest abundance. My experience has been that only a few will be seen in a given locality. Where they occur together with the large, grayish Ground Squirrels of the *Otospermophilus grammurus* group, the hunters sometimes apply the name Silver-gray Squirrel to these tree-climbing Squirrels. The Western Grays have a much broader tail than their eastern relatives and in life are among the handsomest of Squirrels. They spend a great deal of time running about on the ground and do not rely upon the aerial highways through the branches.

They are keen of sight and hearing and take alarm easily. Flattened out upon a limb, they are often able to escape observation from the ground, and if prevented from leaving a tree by the usual methods of descent they make daring leaps from the branches. They utter a hoarse bark which carries for quite a distance. Although severe weather may confine them to their nests for several days at a stretch, they do not hibernate; and, since most of their range lies within the region of mild, open winters, they do not store up large supplies of food.

They build large, bulky nests of twigs or leaves in which to rear the young and also use hollows in tree trunks as dwelling places. The nests are usually placed well up in the trees. The young number from one to four, two or three constituting the average litter. The young may be born any time from April to August in the southwestern states, but doubtless the season is shorter toward the northern part of their range.

Aberti Group.—Tuft-eared Squirrels

Abert Squirrel.—*Sciurus aberti aberti* Woodhouse. Plate XXV.

Resembling a heavy-bodied Gray Squirrel in size and proportions, but differing in heavily tufted ears and in rusty red dorsal band. General color of upperparts grizzled gray; ear tufts blackish; broad dorsal band of chestnut or rusty red; a well-developed black lateral line or band; upper surfaces of hands and feet whitish; tail black, broadly tipped with white on upper surface, white on under surface, with basal band of iron-gray; underparts white. Total length, 21 inches; tail vertebræ, 9 inches; hind foot, 2.75 inches.

Found along the southern rim of the Grand Canyon in northern Arizona south to the Mogollon Mountains and east into New Mexico; limits of range unknown.

Tuft-eared Squirrel.—*Sciurus aberti mimus* Merriam.

"Similar to *S. aberti*, but gray of upperparts decidedly paler; red dorsal area obsolete or nearly so; upperside of tail paler; ear tufts pale fulvous, grizzled and tipped with black (instead of mainly black); tail apparently shorter." (Merriam) Total length, 19.5 inches; tail vertebræ, 8.6 inches; hind foot, 2.8 inches. Found in the Cimarron Mountains, Mora County, New Mexico, north into extreme southwestern Colorado.

Northern Tuft-eared Squirrel.—*Sciurus aberti ferreus* True.

Differing from typical *aberti* in having gray upperparts without the reddish dorsal band; uppersides of feet gray, toes whitish; ear tufts black, mixed with gray and chestnut; tail, above and below, gray banded with black and edged with white; underparts white. Said to occur in a uniform dark brown phase. Total length, 19 inches; tail vertebræ, 8.3 inches; hind foot, 2.3 inches. Found through a narrow strip down the center of Colorado just west of 105° but crossing to the east of this meridian about 39°.

Kaibab Squirrel.—*Sciurus kaibabensis* Merriam.

"Similar in size and general character to *S. aberti*, but underparts mainly black instead of white, and tail mainly white all over instead of white on underside only." (Merriam) Upperparts dark grizzled gray; dorsal band rusty red; nose black; lower sides and upperpart of forelegs and thighs nearly solid black; underparts mixed black and gray. Found on the top of Kaibab Plateau, north side of the Grand Canyon, Coconino County, Arizona.

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The Tuft-eared Squirrels are unique among North American Squirrels in the possession of conspicuous tufts of long hairs on the ears, and resemble in this respect the Tree Squirrels of northern Europe and Asia. They are the showiest of our Squirrels and easily distinguished from all the other large, arboreal Squirrels of North America by the characters of tufted ears and peculiar color pattern.

These Squirrels are rather restricted in their habitat, being found only in a narrow strip along the Rocky Mountains from the southern United States into Mexico. They live on the high plateau through which the Grand Canyon of the Colorado is cut and in the isolated mountain ranges which arise from the Colorado Plateau. The Tuft-eared Squirrels make their homes in the coniferous forests and their altitudinal range is from about 5,000 to 9,500 feet above sea-level.

They do not hibernate but may be inactive during cold weather. They build large nests of leaves, twigs, pine-needles, etc., and also make use of hollow trunks or decayed knot-holes as home sites. Besides the seeds of conifers and acorns, they also eat the bark from the twigs, mushrooms, young birds, and eggs. The call-note is a bark or squall not unlike that of the Eastern Gray Squirrel.

During favorable seasons these Squirrels may be abundant and seen in numbers. They seem to be gregarious and several may be noted together. The young usually number three or four in a litter and probably two families are reared each season.

Subgenus **Guerlinguetus**. Fox Squirrels, etc.

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

Southern Fox Squirrel.—*Sciurus niger niger* Linnæus.

A large, arboreal Squirrel of rather variable color pattern; much larger and heavier in build than the Eastern Gray Squirrels; pelage coarse and harsh; hands and feet large, soles naked; nose and ears always white. "Typical *Sciurus niger* is subject to great variation in color and exhibits three well-marked color phases. These may be called the gray phase, the buff phase, and the black or melanistic phase. The gray phase, in its extreme form is pale smoke gray above, including the tail, and white beneath. The crown is black or blackish and the nose, ears, and feet white. Some specimens in this phase have the feet and underside of tail buff, thus approaching the next darker phase. In the buff phase, the general tone of the upperparts is pinkish buff, the underparts, feet, and underside of tail rich cinnamon-buff or clay color. Numerous intermediate specimens connect this phase with the gray phase. The black or melanistic phase—well-known as occurring frequently in many species of squirrels—is wholly or partly black or dark brown, except the nose and ears, which are white." (Howell) Total length, 27 inches; tail vertebræ, 12 inches; hind foot, 3.5 inches. Found in "Florida and the southeastern states." (Miller) Plate XXV.

Mangrove Fox Squirrel.—*Sciurus niger avicennia* Howell.

"Similar to *Sciurus niger niger* but decidedly smaller; coloration much darker (more tawny) both above and below; feet clearer white (less tinged with buff)." (Howell) Total length, 21.4 inches; tail vertebræ, 10.4 inches; hind foot, 3 inches. Found in the "Mangrove forests on the southwest coast of Florida." (Miller)

Northern Fox Squirrel.—*Sciurus niger neglectus* (Gray).

Similar to typical *niger* but color usually less rusty in hue, underparts generally whitish; ears never white; nose some-

times white. Total length, 23 inches; tail vertebræ, 11 inches; hind foot, 3 inches. Found from "Central Virginia and West Virginia to Pennsylvania." (Miller)

Bryant Fox Squirrel.—*Sciurus niger bryanti* H. H. Bailey.

Said to be distinctly larger than typical *niger*. "Above bluish gray, thickly grizzled with black, ends tipped with white, sides similar; below white. Nose white. Tail with a pronounced black stripe on outer edges." (Bailey)
Found in Dorchester County, Maryland.

Western Fox Squirrel.—*Sciurus niger rufiventer* (Geoffroy).

Much smaller than typical *niger* and but little larger than the Northern Gray Squirrel; color pattern variable but usually tawny brown grizzled with gray above and pale rufous or yellowish brown below; nose and ears never white; tail mixed black and tawny rufous. Total length, 21 inches; tail vertebræ, 9.5 inches; hind foot, 2.8 inches. Found in "Greater part of the Mississippi Valley, from northern Louisiana to southern Wisconsin." (Miller)

Bachman Fox Squirrel.—*Sciurus niger texianus* (Bachman).

Intermediate between typical *niger* and *rufiventer*; larger than *rufiventer* and of same rusty type of coloration; nose and ears whitish but less so than in *niger*. Total length, 25 inches; tail vertebræ, 11 inches; hind foot, 3 inches. Found in the "Coast region of Louisiana and Mississippi." (Miller)

Texas Fox Squirrel.—*Sciurus niger limitis* (Baird).

Similar to *rufiventer* but paler in color and smaller. Upperparts yellowish gray mixed with blackish; underparts orange-buff; black individuals said not to occur. Total length, 19.5 inches; tail vertebræ, 9.5 inches; hind foot, 2.7 inches. Found in "Western Texas and northeastern Mexico." (Miller)

Apache Squirrel.—*Sciurus apache* Allen.

Similar in general appearance to a Fox Squirrel. In summer pelage yellowish brown above grizzled with dusky and gray along the dorsal region; sides brighter and merging into ochraceous underparts; limbs ochraceous; tail long and moderately bushy, blackish brown fringed with whitish above, deep ochraceous bordered with black and edged with whitish below. In winter pelage, with a broad blackish dorsal band from crown to root of tail. Soles of feet naked. Total length, 22 inches; tail vertebræ, 11 inches; hind foot, 3.1 inches. Mainly Mexican in its distribution, but reaching the pine and oak forests of the Chiricahua Mountains of southern Arizona.

Arizona Gray Squirrel.—*Sciurus arizonensis arizonensis* Coues.

Although a member of the same subgenus with the Fox Squirrels, the Arizona Gray Squirrel most resembles the true Gray Squirrels in appearance. General color of upperparts gray, mixed black and white, with broad, yellowish brown dorsal band from crown to root of tail; sides clearer

gray; spot back of ear yellowish brown; tail above black fringed with white, hairs yellowish brown at base, below light ochraceous, banded with black and fringed with white; underparts white. Dorsal band of fulvous most prominent in winter pelage and almost absent in summer. Total length, 22 inches; tail vertebræ, 12 inches; hind foot, 2.9 inches. Found in Arizona and New Mexico; limits of range unknown.

Huachuca Gray Squirrel.—*Sciurus arizonensis huachuca* Allen.

Resembling typical *arizonensis* but with less yellowish brown on the dorsal region and on basal pelage of tail. Total length, 21 inches; tail vertebræ, 10 inches; hind foot, 3 inches. Found from the Huachuca Mountains of southern Arizona south into Mexico. This Squirrel feeds upon walnuts and may become so stained by walnut juice as to lose the true color pattern on the hands, feet, and underparts.

* * * * * * *

The Fox Squirrel is the largest of North American Tree Squirrels and is also the most variable in color. Not only do the various forms of Fox Squirrels differ noticeably from one another, but individuals of the same subspecies show a wide range of variation. The large size, heavy body, and rusty to blackish coloration serve to distinguish these Squirrels from their kin.

Fox Squirrels are usually not as abundant as Gray Squirrels. In many of the states the two occur together, but in no region have the Fox Squirrels ever been noted in such numbers as have been reported for the Grays in the areas of their greatest abundance.

Fox Squirrels spend a great deal of the time on the ground searching for food, but are true Tree Squirrels, nevertheless, and always seek refuge aloft when imminent danger threatens. These Squirrels are not found away from trees. In the north they live in the hardwoods and in the south they are found in pine woods, live oaks or cypresses. They do not migrate like the Grays and in many places are on the verge of extinction. The Fox Squirrel is a favorite with the hunter both because of its size and because it becomes fat in the fall.

This Squirrel utters a hoarse bark and also has a chucking call-note. It is active only by day and does not hibernate, although remaining in a nest during severe cold or stormy periods. It builds nests in hollows or cavities in the trees and also constructs large nests of twigs, leaves, and bark in

the crotches of the limbs. Individuals use the same tree season after season if unmolested.

The young number two to four, the usual number being three, and there is not much evidence to indicate definitely that more than one litter is raised a season. The young are born in March or April.

Subfamily Pteromyinæ

Genus *Glaucomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{2}$; Molars, $\frac{8}{8}$ = 22.

Flying Squirrel.—*Glaucomys volans*

and related forms

General Description.—An arboreal Squirrel of small to medium size, almost entirely nocturnal in habit, with large eyes, very soft pelage, and broad, lateral folds of skin extending



FIG. 55. Flying Squirrel

from wrists to ankles which enclose a slender, cartilaginous process or stiffening rod arising from the wrist; tail flat and broad, tip rounded. Plate XXV.

Color.—Sexes colored alike.²

Upperparts.—Varying with the individual, from drab to pinkish cinnamon, washed with pinkish buff along sides; fur

¹ For a full review of the American Flying Squirrels see Arthur H. Howell, *North American Fauna*, No. 44, 1918.

² Very difficult to convey in a short, written description the color differences between these forms. Often the individual range of variation within a subspecies covers the same shades of color as commonly characterize other subspecies.

slate-colored at base; head grayish, ears light brown; tail above, similar to back, but without pinkish suffusion, below, light pinkish cinnamon; hind feet hair-brown, toes white.

Underparts.—White to roots of hairs, underside of flying membrane edged with pinkish cinnamon.

Summer specimens are usually darker and redder than winter animals.

Measurements.—Total length, 9–9.5 inches; tail vertebræ, 3.6–4.4 inches; hind foot, 1.2 inches.

Geographical Distribution.—A large part of forested North America.

Food.—Nuts, seeds, berries, buds, grain, occasional insects, meat when it can be secured.

Enemies.—Owls, Martens, and Foxes; Weasels and small carnivores on the rare occasions when it comes onto the ground.

Species and Subspecies of the Genus *Glaucomys*

Volans Group

Small Eastern Flying Squirrel.—*Glaucomys volans volans* (Linnæus).

The animal of the preceding description. Found in "Northeastern United States and extreme southern Canada, from central Minnesota, Wisconsin, and Michigan, southern Ontario, northern New York (Lewis County), and southern New Hampshire south to North Carolina (Raleigh), Tennessee (Nashville), and northern Arkansas and Oklahoma (Boston Mountains); west to eastern Nebraska (Otoe and Nemaha Counties) and eastern Kansas (Douglas and Woodson Counties)." (Howell)

Southeastern Flying Squirrel.—*Glaucomys volans saturatus* Howell.

Size of typical *volans* but upperparts darker, snuff-brown to hair-brown; toes not conspicuously white. Found in "Southeastern United States (excepting peninsular Florida and the coast region of Georgia) from South Carolina and western North Carolina west to central Oklahoma and north in the Mississippi Valley to southwestern Kentucky." (Howell)

Florida Flying Squirrel.—*Glaucomys volans querceti* (Bangs).

Resembling typical *volans*; equalling it in size but darker above and lacking white toes; soles of feet always partially naked; not so dark in color as *saturatus*. Found in "Peninsular Florida (south at least to Fort Myers) and the coast region of Georgia." (Howell)

Texas Flying Squirrel.—*Glaucomys volans texensis* Howell.

Size of typical *volans*, but upperparts more ochraceous and toes not conspicuously white; paler than *saturatus*. Upperparts wood-brown with yellowish tinge varying to drab. Found in "Eastern Texas, west to Aledo, Gurley, Elgin, and Cuero; eastern limits of range unknown." (Howell)



FIG. 56. Distribution of the subspecies of *Glaucomys volans*, north of Mexico, after A. H. Howell

1. *Glaucomys volans volans*
2. *Glaucomys volans saturatus*
3. *Glaucomys volans texensis*
4. *Glaucomys volans querceti*

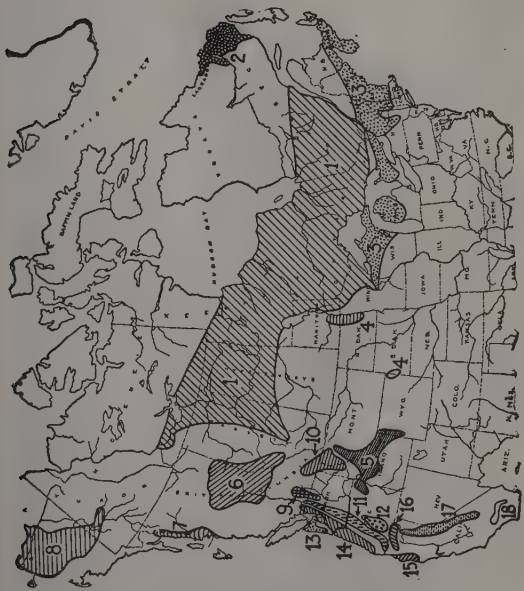
Sabrinus Group

Hudson Bay Flying Squirrel.—*Glaucomys sabrinus sabrinus* (Shaw).

Decidedly larger than *volans*. Total length, 12.5 inches; tail vertebrae, 5.5–6 inches; hind foot, 1.7 inches. Upperparts vinaceous cinnamon; sides of head smoke-gray; eye-ring fuscous; tail above fuscous, below, shaded with pale brown; toes grayish white, soles buffy white on inner side, drab on outer side; underparts, soiled white, washed with pale yellowish and shaded with drab. Found in "Interior of Canada, from Fort Simpson (possibly Fort Anderson),

FIG. 57. Distribution of the subspecies of *Glaucomys sabrinus* (except *G. s. bullatus*), after A. H. Howell

1. *Glaucomys sabrinus sabrinus*
2. *Glaucomys sabrinus makrovikensis*
3. *Glaucomys sabrinus macrolis*
4. *Glaucomys sabrinus ganescens*
5. *Glaucomys sabrinus bangsi*
6. *Glaucomys sabrinus alpinus*
7. *Glaucomys sabrinus zaphæus*
8. *Glaucomys sabrinus yukonensis*
9. *Glaucomys sabrinus columbiensis*
10. *Glaucomys sabrinus latipes*
11. *Glaucomys sabrinus fuliginosus*
12. *Glaucomys sabrinus klamathensis*
13. *Glaucomys sabrinus olympicus*
14. *Glaucomys sabrinus oregonus*
15. *Glaucomys sabrinus stephensi*
16. *Glaucomys sabrinus flaviventris*
17. *Glaucomys sabrinus lasiocarpus*
18. *Glaucomys sabrinus californicus*



Mackenzie, and lower Churchill River, west side of Hudson Bay, south to northern Minnesota, extreme northwestern Wisconsin, southern Ontario (vicinity of Lake Nipissing), and southern Quebec (Lake Edward)." (Howell)

Labrador Flying Squirrel.—*Glaucomys sabrinus makkovikensis* (Sornborger).

Larger than typical *sabrinus*, with upperparts slightly darker and darker face, tail, and feet. Total length, 12–13.2 inches; tail vertebræ, 5.1–5.8 inches; hind foot, 1.7–1.8 inches. Found in "Coast region of Labrador and eastern Quebec; exact limits unknown." (Howell)

Mearns Flying Squirrel.—*Glaucomys sabrinus macrotis* (Mearns).

Smaller than typical *sabrinus*, but ears slightly longer, and with whiter underparts and paler upperparts and hind feet. Upperparts cinnamon; underparts white, with irregular wash of light pinkish cinnamon. Total length, 10.5–11.6 inches; tail vertebræ, 4.6–5.4 inches; hind foot, 1.4–1.5 inches. Found in "Nova Scotia, New Brunswick, Maine, New Hampshire, Vermont, northern Massachusetts, Boreal portions of New York, northern Pennsylvania (?), southern Ontario, northern part of Michigan, and northeastern Wisconsin; west to Elk River, Minnesota." (Howell)

Pale Flying Squirrel.—*Glaucomys sabrinus canescens* Howell.

Size of *macrotis* but paler and head grayer. Upperparts pale pinkish cinnamon. Found in "Southern Manitoba; eastern North Dakota; Black Hills, S. Dak.; and Bear Lodge Mountains, Wyo.; exact limits unknown." (Howell)

Bangs Flying Squirrel.—*Glaucomys sabrinus bangsi* (Rhoads).

Resembling typical *sabrinus* in size and color but rather grayer. Upperparts more drab, feet grayer, underparts never yellowish white but pinkish cinnamon. Found in "Mountains of central Idaho, eastern Oregon, southwestern Montana, and western Wyoming, north to the vicinity of Flathead Lake, Montana; southern limits unknown." (Howell)

Richardson Flying Squirrel.—*Glaucomys sabrinus alpinus* (Richardson).

Like typical *sabrinus* but grayer and less vinaceous above, with darker tail (wood-brown mixed with fuscous both above and below). Total length, 12–13.6 inches; tail vertebræ, 5–6 inches; hind foot, 1.7–1.8 inches. Found in "Rocky Mountain region of Alberta and British Columbia, from vicinity of Henry House north at least to Peace River and Babine Lake, British Columbia (limits of range unknown)." (Howell)

Yukon Flying Squirrel.—*Glaucomys sabrinus yukonensis* (Osgood).

Larger than typical *sabrinus*, tail longer and hind foot broader. Upperparts cinnamon, pinkish to vinaceous.

Total length, 14.5 inches; tail vertebræ, 7.2 inches; hind foot, 1.7 inches. Found in "Yukon River region, from vicinity of Mayo Lake, Yukon (head of Stewart River), to Tanana, Alaska; exact limits unknown." (Howell)

Alaska Coast Flying Squirrel.—*Glaucomys sabrinus zaphæus* (Osgood).

Resembling *alpinus* but browner above and darker below; eye-ring blackish. Total length, 11.6–12.5 inches; tail vertebræ, 5.4–6.1 inches; hind foot, 1.6 inches. Found in "Coast region of southeastern Alaska and northern British Columbia; limits of range unknown." (Howell)

Bachman Flying Squirrel.—*Glaucomys sabrinus oregonensis* (Bachman).

Redder above and below than *zaphæus*, upperparts dark reddish brown, underparts cinnamon or buff. Total length, 11.8–12.4 inches; tail vertebræ, 5–5.5 inches; hind foot, 1.5–1.6 inches. Found in "Coast region of Oregon, Washington, and southern British Columbia; northern and southern limits unknown." (Howell)

Okanagan Flying Squirrel.—*Glaucomys sabrinus columbiensis* Howell.

Paler above and below than *oregonensis*. Upperparts vinaceous cinnamon to vinaceous fawn. Total length, 12.5 inches; tail vertebræ, 5.7 inches; hind foot, 1.7 inches. Found in "Interior valleys and foothills of southern British Columbia and northern Washington, from Shuswap Lake and Cranbrook, British Columbia, south to Lake Chelan, Washington." (Howell)

Cascade Flying Squirrel.—*Glaucomys sabrinus fuliginosus* (Rhoads).

Resembling *columbiensis* but browner above, darker below and less brown on tail; less rufescent than *oregonensis*. Total length, 12.2–12.7 inches; tail vertebræ, 5.6–6.1 inches; hind foot, 1.6–1.7 inches. Found in "Cascade Range, from southern British Columbia south through Washington and Oregon to the Siskiyou Mountains, California." (Howell)

Broad-footed Flying Squirrel.—*Glaucomys sabrinus latipes* Howell.

Size very large; darker and grayer than *fuliginosus*; above, drab mixed with brown. Total length, 12.6–14.5 inches; tail vertebræ, 5.8 to 6.5 inches; hind foot, 1.5–1.8 inches. Found in "Selkirk Range, and other ranges in southeastern British Columbia, higher mountains of northern Idaho and northwestern Montana; south to Mullan and Orofino, Idaho." (Howell)

Olympic Flying Squirrel.—*Glaucomys sabrinus olympicus* (Elliot).

Darkest of American Flying Squirrels; most like *oregonensis* but with less rufous and much fuscous or fuscous black about eyes, ears, flying membranes, feet, and tail above. Total length, 13.1–13.8 inches; tail vertebræ, 6.4–6.6 inches;

hind foot, 1.4–1.6 inches. Found in "Olympic Peninsula, Washington, and south along the coast to southern Oregon; occurring in some localities with *oregonensis*." (Howell)

Sawtooth Mountains Flying Squirrel.—*Glaucomys sabrinus bullatus* (Howell).

Largest of American Flying Squirrels. Total length, 13.1–14.2 inches; tail vertebrae, 5.4–6 inches; hind foot, 1.6–1.8

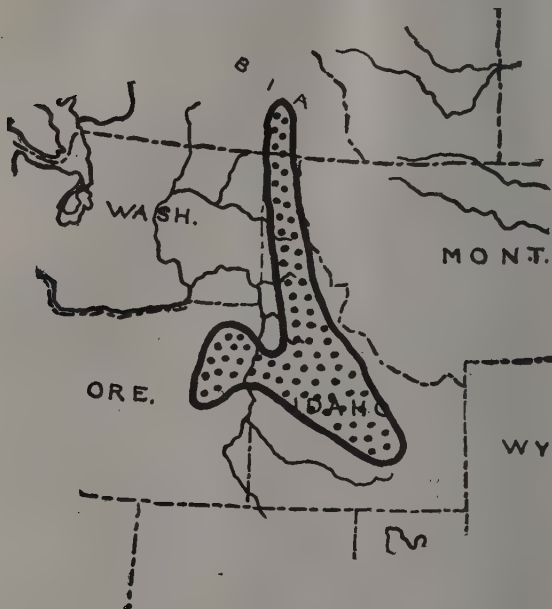


FIG. 58. Distribution of *Glaucomys sabrinus bullatus*, after A. H. Howell

inches. Upperparts from pinkish cinnamon to cinnamon-buff; paler on face; sides of head and neck pale smoke-gray; tail above, like back but mixed with fuscous and tipped with dark gray; below, a lighter shade of cinnamon; underparts creamy white washed with light pinkish cinnamon. Found in "Sawtooth Mountains, Idaho, north to Cranbrook, British Columbia, and west to the Blue Mountains, Oregon." (Howell)

Klamath Flying Squirrel.—*Glaucomys sabrinus klamathensis* (Merriam).

Grayer on upperparts than *fuliginosus* and closely resembling that form. Total length, 12–13.5 inches; tail vertebræ, 5.4–6.2 inches; hind foot, 1.6–1.7 inches. Found in "Central Oregon, chiefly east of the Cascades; northern and eastern limits unknown." (Howell)

Yellow-bellied Flying Squirrel.—*Glaucomys sabrinus flaviventris* Howell.

Resembling but smaller than *klamathensis*, more yellow on feet and underparts, which are whitish washed with pale greenish yellow merging into wood-brown along sides. Total length, 11.5–12.8 inches; tail vertebræ, 5–5.8 inches; hind foot, 1.6–1.7 inches. Found in "Northern California, from the Trinity Mountains in Siskiyou and Trinity Counties east to the Warner Mountains, Modoc County." (Howell)

Sierra Flying Squirrel.—*Glaucomys sabrinus lascivus* (Bangs).

Like *flaviventris* but without yellow suffusion on underparts. Smaller in size. Underparts grayish white with faint wash of light pinkish cinnamon. Total length, 11.8–12.8 inches; tail vertebræ, 5–6 inches; hind foot, 1.6–1.7 inches. Found in "Sierra Nevada Range and northward to eastern Shasta County, California." (Howell)

San Bernardino Flying Squirrel.—*Glaucomys sabrinus californicus* (Rhoads).

Paler and grayer above than *lascivus*, with grayish wash on front of face; upperparts light drab to yellowish wood-brown; underparts soiled whitish with wash of buffy. Total length, 11.2–12.5 inches; tail vertebræ, 5.1–6 inches; hind foot, 1.5–1.6 inches. Found in "San Bernardino and San Jacinto Mountains, California." (Howell)

California Coast Flying Squirrel.—*Glaucomys sabrinus stephensi* (Merriam).

Resembling *lascivus* but redder above, although not so much so as in *oregonensis*. Above, wood-brown; below, whitish with irregular wash of light pinkish cinnamon. Total length, 12–12.5 inches; tail vertebræ, 5.3–6 inches; hind foot, 1.5–1.6 inches. Found in "Coast region of northern California; limits of range unknown." (Howell)

* * * * * * *

Flying Squirrels are found widely distributed throughout the Northern Hemisphere. In North America they are found in greatest abundance in the forests of the colder zones and do not occur south of Texas. The greatest amount of diversification in the American species is shown by the Flying Squirrels of western North America where quite a number of subspecies are found.

The Flying Squirrel is the only American Squirrel which

sleeps during the day and moves about only at night. Except when disturbed, or under exceptional circumstances, this Squirrel is strictly nocturnal and for this reason is seldom seen by the average observer. It has large eyes and probably finds the bright light of day distasteful. Its favorite retreat during the day is a hollow tree, and if such an occupied tree is located the Squirrels may sometimes be driven out by rapping against the trunk. Much remains to be learned of the life-history of this beautiful and attractive mammal. Generally the only specimens a naturalist sees are those he takes in traps set overnight, although the Squirrels may be fairly common in the region.

Flying Squirrels are doubtless the most strictly arboreal of our Squirrels. The peculiar specialization for gliding is evidence of an almost exclusive arboreal existence and these animals are not encountered away from forests. The mode of aerial progression can not be truly called flight, but is rather gliding. The Squirrel throws itself out and down, and with spread lateral membranes converts its falling into a long gliding swoop which may turn up a short distance at the close of the "flight." Except for some slight variation of the angle of fall, the Squirrel has little control of its course once it is in the air. The broad, flat tail probably functions as a depressing or elevating mechanism to steepen or flatten the fall, to a certain degree.

Flying Squirrels have a more or less omnivorous appetite and, besides the nuts and vegetable food enjoyed by Squirrels in general, are frequently attracted by the meat-baits of the fur trappers, often proving a great nuisance in this respect.

These animals make their nest in natural cavities in tree trunks and in old Woodpecker holes. The Squirrels are active throughout the winter and do not hibernate; cold apparently has no terror for the Flying Squirrel, for one subspecies ranges across the Arctic Circle.

The number of young in a Flying Squirrel litter is three to six, and I have seen no records of more than one family of young a year.

Flying Squirrels make beautiful pets, with their soft fur and attractive appearance, and are gentle in behavior, but even as caged animals are not easy of observation because they become active only in the dark.

Family Geomyidæ. Pocket Gophers

Fossorial rodents with large, strong claws on forefeet; small eyes and ears; external, fur-lined cheek-pouches; broad head; thickset body; legs short and stout; scantily haired tail, tip supplied with tactile nerves.

Subfamily Geomyinæ

Genus *Thomomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

Western Pocket Gopher.—*Thomomys bottæ*

and related forms

General Description.—A good-sized rodent, robust in form; incisors strong and broad, very faintly grooved longitudinally on inner edge of anterior face; head broad; neck short; legs



FIG. 59. Pocket Gopher

short; tail rather short, thick, sparsely haired; claws of forefeet long and well developed for digging; claws of hind feet much less specialized; a pair of capacious, fur-lined cheek-pouches opening on sides of face; eyes and ears small; pelage rather fine and soft; habit fossorial, seldom seen above surface of the ground and often known to be present only through the piles of earth thrown out by its excavations. Plate XXVI.

Color.—Sexes colored alike. Summer pelage slightly brighter than that of winter.

¹ For a very full and complete revision of this genus see Vernon Bailey, *North American Fauna* No. 39, 1915.

Upperparts (winter).—Dark ochraceous, heavily sprinkled with black-tipped hairs; pelage slate-colored at base; small blackish patches about nose, cheek, and ear; white about lips, on lining of cheek-pouches, and on feet; tail dusky to brownish gray above and below.

Underparts.—Usually somewhat lighter than upperparts, washed with dull ochraceous, the dark-colored basal pelage showing through.

Measurements.—Males noticeably larger than females. Total length, males, 10.5 inches, females, 9; tail vertebræ, males, 3.2 inches, females, 2.8; hind foot, males, 1.3 inches, females, 1.1 inches.

Geographical Distribution.—Western North America from about 54° southward into Mexico.

Food.—Strictly vegetable, including a wide variety of roots and underground growths, such as bulbs, tubers, etc., as well as surface foliage and green vegetation, occasionally bark; destructive to crops such as potatoes, garden vegetables, alfalfa, clover, grain, and in orchards to the roots of fruit trees, especially apple, pear, and fig trees.

Enemies.—Snakes, Hawks, Owls, Weasels, Coyotes, Foxes, Badgers and Bobcats.

Species and Subspecies of the Genus *Thomomys*

Subgenus *Thomomys*

Bottæ Group

Characterized by coloration mainly dark or light ochraceous; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

California Pocket Gopher.—*Thomomys bottæ bottæ* (Eydoux and Gervais). Plate XXVI.

As described above. Found in "Coast region of California from Sonoma County (Freestone) south to San Diego." (Bailey).

Humboldt Bay Pocket Gopher.—*Thomomys bottæ laticeps* (Baird).

Resembling typical *bottæ*, but color brighter and with less black. Upperparts clear rusty ochraceous with few black-tipped hairs; underparts light buffy ochraceous. Total length, males, 10.5 inches, females, 9; tail vertebræ, males, 3.5 inches, females, 3.1; hind foot, males, 1.3 inches, females,

1.2. Found in "Coast region of northwestern California, from Smith River south to Eel River." (Bailey)

White-toothed Pocket Gopher.—*Thomomys bottæ leucodon* (Merriam).

Similar to typical *bottæ*, but lighter and brighter in color, and smaller; incisors white or tipped with white. Upperparts (winter) dark rusty ochraceous, uniform over entire upperparts; white on feet and often on cheek; underparts light buffy ochraceous, sometimes with white spots on abdomen. Summer pelage, upperparts, dark cinnamon. Total length, males, 9.8 inches; females, 7.5; tail vertebræ, males, 2.8 inches, females 2.4; hind foot, males, 1.3 inches, females 1.1. Found in "Portions of northern California and southwestern Oregon, from Grants Pass, Ore., south to Fairfield and Placerville, Cal." (Bailey)

Red Pocket Gopher.—*Thomomys bottæ navus* (Merriam).

Smaller than typical *bottæ*, lighter in color. Upperparts, in winter, light rusty ochraceous; underparts pale buffy to ochraceous. Brighter and more fulvous in summer pelage. Total length, males, 8.1 inches; females, 7.6; tail vertebræ, males, 2.7 inches, females, 2.5; hind foot, males, 1.1 inches, females, 1.05. Found in "Sacramento Valley, Cal., from Battle Creek, Tehama County, south to Tracy Lake, San Joaquin Valley." (Bailey)

Digger Pine Pocket Gopher.—*Thomomys bottæ mewa* (Merriam).

Size smaller than typical *bottæ* and color different. Upperparts (winter) dull ochraceous tawny with many glossy, black-tipped hairs; underparts bright ochraceous; tail tipped with whitish or gray. Upperparts, in summer, richer ochraceous, blackish about forehead, nose, and ears. Total length, males, 9 inches, females, 7.8; tail vertebræ, males, 2.4 inches, females, 2.1; hind foot, males, 1.1 inches, females, 1.0. Found in "Foothill country on east side of San Joaquin Valley, Cal., from Kernville north to Chinese." (Bailey)

Mendocino Pocket Gopher.—*Thomomys bottæ minor* Bailey.

Smaller and darker than typical *bottæ*; but little brighter in summer than in winter. Upperparts (winter) dark ochraceous to cinnamon-brown, with much black, especially about nose, face, and ears; underparts ochraceous buff. Total length, males, 8.8 inches, females, 7.5; tail vertebræ, males, 2.9 inches, females, 2.4; hind foot, males, 1.16 inches, females, .96 inch. Found in "Coast region of California, from Cape Mendocino south to Cazadero." (Bailey)

Diablo Pocket Gopher.—*Thomomys bottæ diaboli* (Grinnell).

Size of *navus*, brighter in color than typical *bottæ*. Upperparts (summer) bright cinnamon-brown only slightly darkened with black-tipped hairs; underparts clear ochraceous tawny. Winter pelage darker. Total length, males, 8.7 inches, females, 8.0; tail vertebræ, males, 2.6 inches, females, 2.3; hind foot, males, 1.2 inches, females, 1.1.

Found on "Inner ridge of the Coast Ranges along west side of the San Joaquin Valley, Cal." (Bailey)

Los Baños Pocket Gopher.—*Thomomys bottæ angularis* (Merriam).

Size of, but brighter than, typical *bottæ*. Upperparts (summer) bright ochraceous buff, with only few black-tipped hairs; black or dusky about nose, cheeks, and ears. Winter pelage with more black-tipped hairs. Total length, males, 10.3 inches, females, 8.2; tail vertebræ, males, 2.3 inches, females, 2.6; hind foot, males, 1.3 inches, females, 1.1. Found on "West side of San Joaquin Valley, Cal., from Tracy south to Santiago Spring; also Santa Clara, San Juan, and Salinas Valleys." (Bailey)

Fresno Pocket Gopher.—*Thomomys bottæ pascalis* (Merriam). Resembling typical *bottæ* in size. Upperparts (winter) dull ochraceous, not much black on nose, face, and ear patch; underparts pale ochraceous, often irregularly spotted with white along legs, throat, and abdomen. Summer pelage brighter and more fulvous. Total length, males, 8.8 inches, females, 7.8 inches; tail vertebræ, males 2.9 inches, females, 2.5; hind foot, males, 1.3 inches, females, 1.1. Found along "East side of San Joaquin Valley, Cal., from Stockton south to San Emigdio Canyon and Cuyama Valley." (Bailey)

Grapeland Pocket Gopher.—*Thomomys bottæ pallescens* Rhoads. Nearly same size as typical *bottæ*, but paler in color. Upperparts (winter) dull ochraceous, with many black-tipped hairs; underparts pale buffy to nearly whitish. Summer pelage with less black. Total length, males, 10.7 inches, females, 8.3; tail vertebræ, males, 3.4 inches, females, 2.6; hind foot, males, 1.3 inches, females, 1.1. Found in "San Bernardino Valley, Cal., north to San Fernando." (Bailey)

Carrizo Plain Pocket Gopher.—*Thomomys bottæ infrapallidus* (Grinnell).

Resembling typical *bottæ* in size, but paler in color. Upperparts (summer) dull ochraceous buff; underparts pale buffy to whitish. Total length, males, 9.9 inches, females, 8.2; tail vertebræ, males, 3 inches, females, 2.8; hind foot, males, 1.36 inches, females, 1.16. Found on the Carrizo Plain, California.

Stephens Pocket Gopher.—*Thomomys bottæ nigricans* (Rhoads). Much like typical *bottæ* except for smaller size. Upperparts (winter) dark ochraceous tawny, heavily sprinkled with black-tipped hairs; underparts rich ochraceous, but with dark color of underfur showing through. Summer pelage lighter and with more tawny than winter. Total length, males, 9.3 inches, females, 8; tail vertebræ, males, 3.1 inches, females, 2.6; hind foot, males, 1.2 inches, females, 1.1. Found in "Southwestern California and northern Lower California, from the San Jacinto Mountains, Cal., south to Ubar, Lower California." (Bailey)

La Puerta Pocket Gopher.—*Thomomys bottæ puertæ* (Grinnell). Resembling *nigricans* except for paler color. Upperparts (summer) pale ochraceous tawny, somewhat darker along dorsal region; underparts pale cinnamon. Winter pelage darker and grayer. Total length, males, 8.1 inches; tail vertebræ, 3.2 inches; hind foot, 1.1 inches. Found in "La Puerta and San Felipe Valleys, Cal." (Bailey)

San Bernardino Mountain Pocket Gopher.—*Thomomys altivalis* Rhoads.

A large mountain form of the *bottæ* group. Upperparts dull ochraceous, with less black than in typical *bottæ*, but darker dorsal area faintly indicated; blackish on nose, cheeks, and about ear; underparts soiled whitish to buffy. Summer pelage a brighter ochraceous than winter. Total length, males, 10.8 inches, females, 9; tail vertebræ, males, 3.1 inches, females, 2.6; hind foot, males, 1.4 inches, females, 1.2. Found in "San Bernardino Mountains, Cal." (Bailey)

Alpinus Group

Characterized by dark coloration; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

Mt. Whitney Pocket Gopher.—*Thomomys alpinus alpinus* Merriam.

Ears large and conspicuous (for a Pocket Gopher); sexes about same size. Upperparts dull dark ochraceous, blackish along median dorsal region and on nose; feet whitish; tail whitish for last two-thirds of its length; underparts paler than upperparts, throat white. Winter pelage with more yellow and less ochraceous. Total length, males and females, 8.9 inches; tail vertebræ, 2.5 inches; hind foot, 1.2 inches. Found in "Southern part of the Sierra Nevada, Cal., at altitudes between 6,000 and 11,000 feet, from Mount Whitney south to Siretta Meadows." (Bailey)

Yosemite Pocket Gopher.—*Thomomys alpinus awahnee* Merriam.

Smaller than typical *alpinus*. Upperparts (summer) dull dark ochraceous; underparts pale buffy to ochraceous, often with irregular white spots and marks of white on abdomen. Winter pelage darker, ochraceous tinged with dusky. Total length, males, 8.8 inches, females, 7.8; tail vertebræ, males, 3.0 inches, females, 2.2; hind foot, males, 1.1 inches, females, 1.04. Found along "Western slopes of the Sierra Nevada, Cal., from Sequoia, Tuolumne County, south to Tehachapi Peak." (Bailey)

San Gabriel Pocket Gopher.—*Thomomys neglectus* Bailey.

Resembling *altivallis* in external appearance but differentiated by cranial characters. Upperparts (summer) dull ochraceous, heavily sprinkled with black-tipped hairs to give general impression of dark gray; underparts dull buffy.

Winter pelage unknown. Total length, males, 9.2 inches, females, 8.2; tail vertebræ, males, 3.1 inches, females, 2.6; hind foot, males, 1.3 inches, females, 1.2. Has been found only on "San Antonio Peak (Bear Flat Meadows at 6,400 feet altitude) in the San Gabriel Mountains, California." (Bailey)

San Jacinto Pocket Gopher.—*Thomomys jacinteus* Grinnell and Swarth.

Superficially resembling *nigricans*, but more closely related to *neglectus*. Upperparts (summer) rich ochraceous, dark in tone, sprinkled with black-tipped hairs which are thickest along dorsal region; underparts ochraceous, brighter in tone than upperparts. Winter pelage with more black on upperparts. Total length, males, 9.5 inches, females, 9.3; tail vertebræ, males, 3.2 inches, females, 3.04; hind foot, males, 1.28 inches, females, 1.16. Found on "Upper slopes of San Jacinto Mountains, Cal." (Bailey)

Perpallidus Group

Characterized by buffy or yellowish coloration (except *apache*) and by mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

Palm Springs Pocket Gopher.—*Thomomys perpallidus perpallidus* (Merriam).

Color very pale; ears small; tail long. Upperparts (summer) buffy to cream color; dusky about ear, grayish brown on nose and cheeks; feet and tail whitish; underparts whitish. Winter pelage even paler than summer. Total length, males, 9.6 inches, females, 8.6; tail vertebræ, males, 3.4 inches, females, 3.1; hind foot, males, 1.26 inches, females, 1.20. Found in "Colorado Desert, southern California, from Whitewater south to Salton Sea." (Bailey)

White Pocket Gopher.—*Thomomys perpallidus albatrus* (Grinnell).

Larger in size, paler in color than typical *perpallidus*. Upperparts pale buff to cream color; grayish brown on nose and about ears; feet and tail with sparse, short, white hairs, nearly naked; underparts creamy to white, with dark color of underfur absent or much reduced. Winter pelage like summer but with more extensive dark underfur on abdomen. Total length, males, 10.9 inches, females, 9.2; tail vertebræ, males, 4.0 inches, females, 3.2; hind foot, males, 1.4 inches, females, 1.36. Found in "Southeastern California and northeastern Lower California from Carrizo Creek south to Gardner's Lagoon, Salton River." (Bailey)

Yellow-backed Pocket Gopher.—*Thomomys perpallidus chrysonotus* Grinnell.

Smaller than typical *perpallidus*; ears very small; pelage as in *perpallidus*. Upperparts (summer) pale buff to buff;

ears brown-tipped; nose brown; underparts whitish, underfur pale plumbeous. Winter pelage grayer than summer. Total length, males, 8.7 inches, females, 8.1; tail vertebræ, males, 2.9 inches, females, 2.6; hind foot, males, 1.20 inches, females, 1.08. Found in "Southwestern Arizona and northwestern Sonora, from Ehrenberg south to near mouth of Colorado River, and east to Quitobaquito." (Bailey)

Mohave River Pocket Gopher.—*Thomomys perpallidus mohavensis* Grinnell.

Much darker above than typical *perpallidus* and with shorter tail. Upperparts bright cinnamon-buff. Lighter than *perpes* and with more of a cinnamon tinge on dorsal area, also slightly larger. Total length, males, 9.2 inches, females, 8.5 inches; tail vertebræ, males, 3 inches, females, 2.6 inches; hind foot, males, 1.2 inches, females, 1.16 inches. Found along the bottom-lands of the Mohave River, San Bernardino County, California, and along the southern rim of the Mohave Desert to Los Angeles County.

Lone Pine Pocket Gopher.—*Thomomys perpallidus perpes* (Merriam).

Resembling typical *perpallidus* but tail shorter, ears larger and color brighter. Upperparts (summer) bright buffy ochraceous; dusky about ear, grayish brown on nose; underparts creamy white to buffy, often pure white on throat. Winter pelage darker and duller than summer, grayish buff. Total length, males, 8.6 inches, females, 8.4; tail vertebræ, males, 2.6 inches, females, 2.6; hind foot, males, 1.14 inches, females, 1.14. Found in "Upper Sonoran desert valleys and mountain slopes of eastern California, from near head of Owens Valley south to Hesperia and Morongo Valley, into the valley of Kern River, and east to the Providence Mountains, Cal., and the Grapevine Mountains, Nev." (Bailey)

Amargosa Pocket Gopher.—*Thomomys perpallidus amargosæ* Grinnell.

Paler and less tawny than *perpes*, larger and with more extensive dark patch about ear. Size large for the group; upperparts pallid dull pinkish buff tinged with yellow. Total length, males, 10 inches, females, 8.7 inches; tail vertebræ, males, 3.1 inches, females, 2.7 inches; hind foot, males, 1.3 inches, females, 1.2 inches. Found about permanent springs in the Valley of the Amargosa "River" which leads into Death Valley, Inyo County, California; in Lower Sonoran Zone.

Gray Pocket Gopher.—*Thomomys perpallidus canus* (Bailey). Buff gray in color, larger than typical *perpallidus*, with larger ears and shorter tail. Upperparts (summer) pale buffy gray, nose brownish, ear patch dusky; underparts whitish. Winter pelage darker. Total length, males, 9.7 inches, females, 8.6; tail vertebræ, males, 2.6 inches, females, 2.6; hind foot, males, 1.3 inches, females, 1.2.

Found in "Valleys of western and central Nevada, from Flowing Springs, western Humboldt County, south to Cloverdale and Monitor Valley, west to Honey Lake, Cal." (Bailey)

Yellow Pocket Gopher.—*Thomomys perpallidus aureus* (Allen). Color golden buff, ear small. Upperparts (winter) bright orange-buff, variable in shade, sometimes with dusky wash along dorsal region; dusky to blackish on nose and about ear; feet and tail creamy white; underparts creamy white. Summer pelage like winter but a trifle darker. Total, length, males, 9.6 inches, females, 8.9; tail vertebræ, males, 2.9 inches, females, 3.1; hind foot, males, 1.24 inches, females, 1.20. Found in "Desert region of southern Nevada southern Utah, western Colorado, central and northwestern New Mexico, and northern and western Arizona." (Bailey)

Jicarilla Pocket Gopher.—*Thomomys perpallidus apache* (Bailey).

Dark in color, large in size (for this group). Upperparts dull sooty gray, with light wash of dull ochraceous, a dark dorsal band of blackish faintly indicated; tail brownish to blackish for dorsal half or three-quarters, rest white in marked contrast; feet white; underparts uniform with upper, except for white on lips and less often on chin. Total length, males and females, 9.2 inches; tail vertebræ, 3 inches; hind foot, 1.33 inches. Found in "Transition Zone in northeastern Arizona, northwestern New Mexico, and southwestern Colorado." (Bailey)

White Mountains Pocket Gopher.—*Thomomys melanotis* Grinnell.

Color very pale and similar to that of typical *perpallidus*, but with more dusky nose and mouth and with more extensive, slaty black ear patch; ear extremely small, densely clothed with fine black hairs; general size medium. Total length, males, 9.5 inches, females, 8.8 inches; tail vertebræ, males, 3.1 inches, females, 2.7 inches; hind foot, males, 1.2 inches, females, 1.1 inches. Found at high elevations (10,000–10,500 feet) in the White Mountains, Mono County, California.

Cabazon Pocket Gopher.—*Thomomys cabazonæ* Merriam.

Resembling *perpes* in color but with larger ears. Upperparts (summer) from buffy ochraceous to dull brownish dusky to blackish on nose, lips, and about ears; underparts varying from creamy white to buffy or salmon. Total length, males, 8.8 inches, females, 8.3; tail vertebræ, males, 3.2 inches, females, 2.8; hind foot males, 1.20 inches, females, 1.14. Found from "San Gorgonio Pass, southern California, south to Cabazon." (Bailey)

Owens Lake Pocket Gopher.—*Thomomys operarius* Merriam.

Resembling *aureus* in color but differentiated by short, heavy rostrum and other skull characters. Upperparts pale ochraceous to rich buff; gray to dark gray about ear; feet

and tail creamy white; underparts creamy white. Total length, males, 9 inches, females, 8.7; tail vertebræ, males, 2.8 inches, females, 2.6; hind foot, males, 1.22 inches, females, 1.16. Found only on east side of Owens Lake, California (Keeler, 3,600 feet altitude).

Painted Desert Pocket Gopher.—*Thomomys latirostris* Merriam.

Somewhat resembling *aureus* in cranial characters, but rather unique in most of its characters. Upperparts (summer) varying from pale buff orange to bright buffy yellow and lacking black-tipped hairs; dusky about ears, grayish brown on nose; feet and tail white; underparts white, occasionally tinged with sulphur-yellow on abdomen. Total length, males, 9.3 inches; tail vertebræ, 3.2 inches; hind foot, 1.3 inches. A rare species known only from the Painted Desert of Arizona.

Phoenix Pocket Gopher or Fawn-colored Pocket Gopher.—*Thomomys cervinus* Allen.

Large in size, pale fawn in color. Upperparts (summer) pale fawn; conspicuous blackish patch about ear; brownish to blackish on nose and cheeks; feet and tail fawn, paler than upperparts; underparts a paler shade of fawn than upperparts. Total length, males, 10.1 inches, females, 9.8; tail vertebræ, males, 3.4 inches, females, 3.1; hind foot, males, 1.40 inches, females, 1.36. Found in the upper Gila Valley, Arizona.

Fulvous Group

Characterized by tawny color; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

Fulvous Pocket Gopher.—*Thomomys fulvus fulvus* (Woodhouse).

Medium in size, tawny to chestnut in color; ears medium. Upperparts (summer) dark tawny to light chestnut, often darker along dorsal region which may be dusky to blackish; dusky to blackish on nose, cheeks, and about ears; feet whitish; tail dusky above, grayish below; underparts a lighter shade of same color as upperparts, chin usually whitish. Winter pelage duller and darker. Total length, males, 8.8 inches, females, 8.2; tail vertebræ, males, 3.0 inches, females, 2.6; hind foot, males, 1.20 inches, females, 1.16. Found in "Transition Zone in northern and central Arizona from the Trumbull Mountains to the White Mountains; east in New Mexico to Sierra Grande, and the White and Guadalupe Mountains; north to Fisher Peak, southeastern Colorado." (Bailey)

Espanola Pocket Gopher.—*Thomomys fulvus pervagus* (Merriam).

Larger in size and lighter in color than typical *fulvus*. Upperparts (summer) uniform bright tawny, blackish on nose,

cheek, and about ears; underparts pale tawny. Winter pelage like summer but slightly duller. Total length, males, 9.6 inches, females, 9.0; tail vertebræ, males, 3.0 inches, females, 2.7; hind foot, males, 1.30 inches, females, 1.25. Found in "Upper Rio Grande and San Luis Valleys in northern New Mexico and southern Colorado." (Bailey)

Desert Pocket Gopher.—*Thomomys fulvus desertorum* (Merriam).

Somewhat resembling typical *fulvus* but noticeably smaller and brighter colored; sexes about equal in size. Upperparts (summer) bright orange-tawny to orange-cinnamon; dusky on nose, cheeks, and about ears; feet and tail dirty white to buffy; underparts creamy white or with light cinnamon wash. Winter pelage with more yellow, duller in tone. Total length, males and females, 7.8 inches; tail vertebræ, 2.5 inches; hind foot, 1.04 inches. Found in "Detrital and Big Sandy Valleys, northwestern Arizona; east in the Grand Canyon to Prospect Valley." (Bailey)

Mountain-top Pocket Gopher.—*Thomomys fulvus intermedius* Mearns.

Resembling typical *fulvus* but smaller and with well-defined black dorsal band. Upperparts (summer) dark tawny with darker dorsal region, brownish black to black, occasionally forming a conspicuous black band from nose to tail; feet dirty white; tail brown, tipped with whitish; underparts pale tawny. Total length, males and females, 8.0 inches; tail vertebræ, 2.5 inches; hind foot, 1.0 inches. Found along "Upper slopes of mountains in southeastern Arizona and extreme southwestern New Mexico." (Bailey)

Davis Mountain Pocket Gopher.—*Thomomys fulvus texensis* Bailey.

Smaller than typical *fulvus*, lighter in color. Upperparts (summer) tawny gray; blackish on nose, cheeks, and about ear, gray on feet and lips; underparts tawny, brighter than upperparts. Winter pelage darker and less bright than summer. Found only in the Davis Mountains, Texas (5,500 feet altitude).

Toltec Pocket Gopher.—*Thomomys fulvus toltecus* (Allen).

Resembling typical *fulvus* in size but paler and grayer. Upperparts (summer) dull ochraceous tawny, brownish on nose, blackish about ear; feet whitish; tail buffy gray; underparts like upperparts but lighter in shade. Winter pelage grayer on upperparts and with dusky along dorsal region. Total length, males, 8.8 inches, females, 8.2; tail vertebræ, males, 2.9 inches, females, 2.6; hind foot, males, 1.26 inches, females, 1.16. Found in "Lower Sonoran valleys and deserts of southeastern Arizona, southwestern New Mexico, and adjacent parts of Chihuahua and Sonora, south to Colonia Juarez, Chihuahua." (Bailey)

Mearns Pocket Gopher.—*Thomomys mearnsi* Bailey.

Smaller than typical *fulvus* and less dusky in color. Upper-

parts (summer) dull cinnamon to light tawny, blackish on nose and about ear; feet whitish; tail buffy gray; underparts pale cinnamon. Winter pelage with more gray. Total length, males, 8.8 inches, females, 8.0; tail vertebræ, males, 2.7 inches, females, 2.6; hind foot, males, 1.24 inches, females, 1.16. Found only in the Animas Valley, southwest New Mexico.

Sierra Blanca Pocket Gopher.—*Thomomys baileyi* Merriam.

Upperparts (winter pelage only is known) dull ochraceous tawny to buffy fulvous, dusky on nose and about ear; feet dirty whitish; tail buffy; underparts creamy white to pale salmon. Total length, males, 8.6 inches, females, 8.5; tail vertebræ, males, 2.6 inches, females, 2.8; hind foot, males, 1.24 inches, females, 1.16. Found in "Sierra Blanca, western Texas, north to Tularosa, N. Mex." (Bailey)

Lachuguilla Pocket Gopher.—*Thomomys lachuguilla* (Bailey).

Small in size, resembling *aureus* in superficial appearance, but paler. Upperparts dull ochraceous tawny to grayish buff, dusky on nose and about ear; feet whitish; underparts pale cinnamon to dirty white. Total length, males, 8.6 inches, females, 8.1; tail vertebræ, males, 2.6 inches, females, 2.4; hind foot, males, 1.16 inches, females, 1.04. Found in "Arid Lower Sonoran mesas in extreme western Texas and southern New Mexico, south to Casas Grandes, Chihuahua." (Bailey)

Umbrinus Group

Little Gray Pocket Gopher.—*Thomomys perditus* Merriam.

Small in size; buffy gray to pale tawny in color. Upperparts dark buffy gray to pale dull tawny; sides brighter than back; dusky on nose, lips, and about ears; feet buffy to creamy white; underparts like feet. Total length, males, 7.7 inches, females, 7.2; tail vertebræ, males, 2.3 inches, females, 2.2; hind foot, males, 1.06 inches, females, .98. Found in "Eastern Coahuila and western Nuevo Leon, north to Rock Springs and Castle Mountains, western Texas." (Bailey)

Talpoides Group

Characterized by mammæ in six pairs or more (inguinal, 2-2; abdominal, 2-2; pectoral, 2-2).

Saskatchewan Pocket Gopher.—*Thomomys talpoides talpoides* (Richardson).

"Size medium; ears prominent and pointed; claws slender; color dull and dark gray." (Bailey) Upperparts (summer) dull grayish brown; darker, almost black, on nose and about ear; feet whitish; tail whitish, often only white-tipped; underparts varying from buffy to dirty whitish gray; pure white on chin and sometimes on throat and breast. Winter

pelage much like summer. Total length, males and females, 8.5 inches; tail vertebræ, 2.4 inches; hind foot, 1.15 inches. Found on "Plains of Saskatchewan and Alberta; south in Montana to Great Falls and the Big Snowy Mountains." (Bailey)

Prairie Pocket Gopher or Dakota Pocket Gopher.—*Thomomys talpoides rufescens* (Wied).

Larger and darker than typical *talpoides*. Upperparts (summer) dull brownish gray; black about ear and on ear; underparts buffy gray, whitish to pure white from chin to breast. Winter pelage grayer than summer. Total length, males and females, 9.2 inches; tail vertebræ, 2.8 inches; hind foot, 1.24 inches. Found in "Greater part of North Dakota, eastern South Dakota, and southwestern Manitoba." (Bailey)

Coues Pocket Gopher.—*Thomomys talpoides clusius* (Coues).

Smaller than typical *talpoides*, claws more slender; more rufescent in color. Upperparts (summer) light buffy varying to hazel, washed with gray; crown brighter than sides; gray on cheeks, blackish about ears; underparts whitish to buffy, with occasionally white on chin. Winter pelage dull hazel washed with grayish or buffy brown. Total length, males and females, 8.2 inches; tail vertebræ, 2.5 inches; hind foot, 1.1 inches. Found in "Central and southeastern Wyoming (north to Parkman, Sheridan County), and eastern Colorado south to Colorado Springs." (Bailey)

Sagebrush Pocket Gopher.—*Thomomys talpoides bullatus* Bailey.

Brighter in color than typical *talpoides* but like it in size. Upperparts like *clusius* but less gray on cheeks; underparts buffy. Winter pelage paler above than summer, light buffy gray, underparts creamy white. Total length, males, 9.6 inches, females, 9.0; tail vertebræ, males, 3.0 inches, females, 3.1; hind foot, males, 1.20 inches, females, 1.16. Found in "Plains of eastern Montana, northeastern Wyoming, and western South Dakota; north to Medicine Hat, Alberta." (Bailey)

Black Hills Pocket Gopher.—*Thomomys talpoides nebulosus* Bailey.

Resembling typical *talpoides* in size but pelage with more brownish gray. Upperparts (summer) dull brownish gray; darker on nose and about ear, dusky or blackish; feet grayish to buffy; tail like feet; underparts buffy with more or less white on chin and breast. Winter pelage dark buffy gray above, light buffy below. Total length, males and females, 9.2 inches; tail vertebræ, 2.6 inches; hind foot, 1.26 inches. Found in "Black Hills, S. Dak., and Bear Lodge Mountains, Wyoming." (Bailey)

Bighorn Pocket Gopher.—*Thomomys talpoides caryi* Bailey.

Resembling *clusius*, slightly smaller, more rufescent, less gray. Upperparts (summer) warm grayish brown; nose

and about ear darker, slate-colored to black; underparts warm buff, chin and sometimes breast white. Winter pelage dark buffy gray above, creamy below. Total length, males and females, 8.1 inches; tail vertebræ, 2.3 inches; hind foot, 1.1 inches. Found in "Canadian Zone on Big-horn Mountains, Wyoming." (Bailey)

Pryor Mountain Pocket Gopher.—*Thomomys talpoides pryori* (Bailey).

Similar to *clusius* in size but darker in color. Upperparts (summer) dull walnut-brown; nose slate-colored; black about ears; dark gray on cheeks; dirty whitish to buffy on feet and tail. Underparts dark buff, lacking white on chin, throat, and breast. Winter pelage grayer. Total length, males, 8.2 inches, females, 8.0; tail vertebræ, males, 2.4 inches, females, 1.1; hind foot, males, 1.16 inches, females, 1.14. Found in "Pryor Mountains, Mont., east to the Big-horn River near Fort Custer." (Bailey)

San Luis Pocket Gopher.—*Thomomys talpoides agrestis* Merriam.

Larger and paler than *clusius*. Upperparts (summer) buffy to brownish gray, brightest along dorsal area; blackish about ear, grayish on nose, feet, and tail; underparts buffy, occasionally with white spot on chin. Winter pelage lighter and grayer. Total length, males and females, 8.8 inches; tail vertebræ, 2.3 inches; hind foot, 1.2 inches. Found in "San Luis Valley, Colo." (Bailey)

Columbia Pocket Gopher.—*Thomomys columbianus* (Bailey).

Smaller and paler than typical *talpoides*. Upperparts (summer) brownish gray to buffy gray; black on ear and behind ear; nose slate-colored; feet and tail grayish or whitish; underparts pale buffy gray. Winter pelage grayer, but very similar to summer. Total length, males and females, 8.3 inches; tail vertebræ, 2.3 inches; hind foot, 1.1 inches. Found on "Plains of southeastern Washington and northern Oregon." (Bailey)

Green River Pocket Gopher.—*Thomomys ocius* (Merriam).

Small in size, pale in color. Upperparts (summer) light buffy gray, with more buffy or brown from crown along back; sides grayer, like cheeks, but lighter in shade; small blackish patch about ear, dirty whitish on feet and tail; underparts creamy to dirty whitish. Winter pelage lighter above than summer. Total length, males, 8.2 inches, females, 7.8; tail vertebræ, males, 2.4 inches, females, 2.3; hind foot, males, 1.04 inches, females, 1.00. Found in "Green River Basin of southwestern Wyoming, northwestern Colorado, and northeastern Utah." (Bailey)

Idaho Pocket Gopher.—*Thomomys idahoensis* Merriam.

"Size very small; color pale yellowish gray; ears small." (Bailey) Upperparts (summer) pale buffy gray, dull in tone; yellowish on nose, very little dark color about ear; feet and tail well haired, whitish to pale buffy; underparts

dirty whitish to pale buff, sometimes with white on chin. Winter pelage unknown, but probably very pale. Total length, males, 7.2 inches, females, 6.6; tail vertebræ, males, 2.0 inches, females, 2.0; hind foot, males, .9 inch, females, .9. Found on "Snake River Plains, southeastern Idaho." (Bailey)

Pygmy Pocket Gopher.—*Thomomys pygmæus* Merriam.

Smallest Pocket Gopher of the genus *Thomomys*; ears small; color a rich brown. Upperparts (summer) a uniform rich hazel-brown; nose slaty, dusky patch about ear reduced; feet and tail whitish to buffy; underparts dull ochraceous, only rarely with white on chin or breast. Winter pelage paler than summer, brown more buffy. Total length, males, and females, 6.7 inches; tail vertebræ, 2.0 inches; hind foot, .9 inch. Found in "Southwestern Wyoming and southeastern Idaho (Transition Zone)." (Bailey)

Fossor Group

Characterized by mammæ in five pairs (inguinal, 2-2; pectoral, 3-3.)

Colorado Pocket Gopher.—*Thomomys fossor* Allen.

Medium in size, dark and dull in color; ears large, fur long and soft. Upperparts (summer) dull dark brown varying occasionally to rich chestnut; blackish on nose, face, and about ear; whitish on feet, tip of tail, often on chin and occasionally on chest; underparts buffy to ochraceous. Winter pelage duller and grayer. Total length, males, 8.8 inches, females, 8.8; tail vertebræ, males, 2.7 inches, females, 2.5; hind foot, males, 1.3 inches, females, 1.16. Found in "Mountains of western Colorado, extreme southern Wyoming, northern New Mexico, eastern and southern Utah, and northwestern Arizona." (Bailey)

Fort Bridger Pocket Gopher.—*Thomomys bridgeri* Merriam.

Large in size, dark in color, with large and prominent ears. Upperparts (summer) rich brown, warm in tone; dusky brown on nose and face; considerable black about ear; feet and tail grayish, the latter with brownish tinge and sometimes white-tipped; underparts dark buffy to dull ochraceous, sometimes with white on chin. Winter pelage dull, dark brown above, washed with buffy below. Total length, males, 9.5 inches, females, 9.1; tail vertebræ, males, 2.8 inches, females, 2.7; hind foot, males, 1.36 inches, females, 1.33. Found in "Southwestern Wyoming and southeastern Idaho (Transition Zone)." (Bailey)

Uinta Pocket Gopher.—*Thomomys uinta* Merriam.

Almost indistinguishable from *fossor* externally, but skull shorter and wider. Upperparts (summer) dull dark brown; dusky on nose and face, blackish on ear and back of ear; underparts buffy to ochraceous. Winter pelage duller and

grayer. Total length, males, 9.0 inches, females, 8.2; tail vertebræ, males, 2.8 inches, females, 2.6; hind foot, males, 1.24 inches, females, 1.12. Found in "Western Wyoming, southeastern Idaho, and northern Utah." (Bailey)

Dalles Pocket Gopher.—*Thomomys quadratus quadratus* Merriam.

Smaller and brighter colored than *fossor*. Upperparts (summer) light russet; blackish on nose and about ear; feet whitish; tail brownish, dirty whitish at tip; underparts dark buff, slate-colored underfur showing through. Winter pelage grayer. Total length, males, 8.2 inches, females, 7.8; tail vertebræ, males, 2.6 inches, females, 2.5; hind foot, males, 1.08 inches, females, 1.06. Found on "Plains of eastern and central Oregon, northeastern California, and northwestern Nevada." (Bailey)

Fisher Pocket Gopher.—*Thomomys quadratus fisheri* (Merriam).

Smaller than typical *quadratus*, color paler, tail shorter. Upperparts (summer) buffy gray, with dull russet tinge on dorsal area; slaty on nose, blackish about ear; whitish on feet, chin, underside of tail; tail above gray; underparts buffy. Winter pelage very similar to summer pelage, but slightly grayer. Total length, males and females, 7.7 inches; tail vertebræ, 2.3 inches; hind foot, 1.0 inches. Found in "Northern, central, and western Nevada; west in California to Sierra Valley and Mona Lake." (Bailey)

Douglasii Group

Characterized by ears large and rounded at tips; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

Douglas Pocket Gopher or Columbia Sand Rat.—*Thomomys douglasii douglasii* (Richardson).

"Size medium; claws stout; ears medium with rounded tips; color nearly uniform dull hazel without dark ear patch." Upperparts (summer) dull hazel; sides slightly paler; gray on nose; soiled whitish on feet and tail; underparts more ochraceous than upperparts. Total length, males, 8.6 inches, females, 8.0; tail vertebræ, males, 2.6 inches, females, 2.3; hind foot, males, 1.2 inches, females, 1.14. Found along the Columbia River near Vancouver, Washington.

Oregon Pocket Gopher.—*Thomomys douglasii oregonus* Merriam.

Resembling typical *douglasii* in size but color brighter and ears smaller. Upperparts (summer) clear bright hazel, dusky on nose and cheeks and blackish about ears; underparts paler, with more of an ochraceous tone. Total length, males, 8.8 inches, females, 8.2; tail vertebræ, males, 2.8 inches, females, 2.6; hind foot, males, 1.20 inches, females, 1.13. Found about Oregon City, Oregon.

Yelm Pocket Gopher.—*Thomomys douglasii yelmensis* Merriam.

Resembling typical *douglasii*, but color duller and darker, ears more pointed and with conspicuous black patches. Upperparts (faded summer pelage) dull hazel; dusky on nose and sides of face, blackish on ears and about ears, white on feet, tail, and sometimes white spot on breast or on side; underparts buffy, irregularly spotted with white. Total length, males, 8.9 inches; tail vertebræ, 2.7 inches; hind foot, 1.28 inches. Found on "Prairies around south end of Puget Sound, Wash." (Bailey)

Tacoma Pocket Gopher.—*Thomomys douglasii tacomensis* Taylor.

"Darker than any others of the "pocket gophers" occupying the lowlands of western Washington. Similar to *Thomomys douglasii yelmensis* to which it appears to be most closely related, but upperparts and face darker; postauricular black area more extensive; . . ." (Taylor) Upperparts (winter) cinnamon-buff grizzled with blackish; blackish on face and back of ear; underparts pale gray. Total length, males, 8.8 inches, females, 8.5 inches; tail vertebræ, males, 2.5 inches, females, 2.6 inches; hind foot, males, 1.2 inches, females, 1.16 inches. Found in Pierce County, Washington; limits of range unknown.

Black-headed Pocket Gopher.—*Thomomys douglasii melanops* (Merriam).

Similar to *yelmensis* but blacker on nose and head. Upperparts (summer) dark russet; dusky on nose and face, extensively black about ears; white on feet, tip of tail, chin (usually), and wrists; underparts ochraceous. Total length, females, 8.2 inches; tail vertebræ, 2.5 inches; hind foot, 1.1 inches. Measurements of males unknown. Found in "Olympic Mountains, Wash." (Bailey)

Rainier Pocket Gopher.—*Thomomys douglasii shawi* Taylor.

Resembling *limosus* but larger, paler, and less intense brown. Upperparts (August) cinnamon-buff, sides pinkish buff; spot back of ear slaty blackish, inconspicuous; tip of nose usually with white spot; underparts whitish with wash of buffy; tops of feet white. Total length, males, 9.1 inches, females, 8.3 inches; tail vertebræ, males, 2.9 inches, females, 2.4 inches; hind foot, males, 1.3 inches, females, 1.2 inches. Found on the "East side of Mount Rainier National Park; also the Cascade Mountains in the vicinity of Mount Aix, Cowlitz Pass, and Goat Rocks. Life Zone, Hudsonian." (Taylor)

White Salmon Pocket Gopher.—*Thomomys douglasii limosus* (Merriam).

Resembling typical *douglasii*, but darker in color and with blackish ear patch. Upperparts (summer) dull chestnut; slaty on nose, blackish about ear; feet and tail dirty white; underparts paler than upperparts, more nearly ochraceous.

Total length, males, 9.0 inches, females, 8.6 inches; tail vertebræ, males, 2.7 inches, females, 2.6; hind foot, males, 1.2 inches, females, 1.1. Known only from "White Salmon, gorge of the Columbia, Klickitat County, Washington." (Bailey)

Black Pocket Gopher.—*Thomomys niger* Merriam.

Most resembling typical *douglasii*, but black in color. "Upperparts uniform glossy black with purple and green iridescence; underparts duller and more plumbeous; feet and distal portion of tail white. Young, sooty black." (Bailey) Total length, males, 9.0 inches, females, 8.6; tail vertebræ, males, 3.2 inches, females, 2.8; hind foot, males, 1.2 inches, females, 1.2. Found in "Coast region of west-central Oregon." (Bailey)

Monticola Group

Characterized by ears relatively large and pointed; mammae in four pairs (inguinal, 2-2; pectoral, 2-2).

California Mountain Pocket Gopher.—*Thomomys monticola monticola* Allen.

Small in size, ears large and pointed, feet and claws slender. Upperparts (winter) dull hazel; slaty on nose, blackish about ear; tail whitish, sometimes with dusky on upper basal surface; underparts dull buffy. Summer pelage brighter in tone, tawny. Total length, males, 8.5 inches, females, 8.4; tail vertebræ, males, 2.8 inches, females, 2.7; hind foot, males, 1.10 inches, females, 1.06. Found in "Sierra Nevada of California and Nevada, from Lassen Peak south to Mammoth Pass." (Bailey)

Mazama Pocket Gopher.—*Thomomys monticola mazama* (Merriam).

Darker and more richly colored than typical *monticola*, but like it in size. Upperparts (summer) bright russet brown; slaty on nose, blackish about ear, whitish on feet and tail. Underparts warmer buff to ochraceous. Winter pelage unknown. Total length, males and females, 8.2 inches; tail vertebræ, 2.6 inches; hind foot, 1.12 inches. Found in "Cascade and Siskiyou Mountains, Ore., south in California to the Trinity Mountains." (Bailey)

Yellow Pine Pocket Gopher.—*Thomomys monticola pinetorum* Merriam.

Resembling typical *monticola*, but brighter brown above and with gray on nose and cheeks. Upperparts (summer) yellowish hazel (color of yellow-pine bark); blackish about ears, slaty to grayish on nose and cheeks, grayish to whitish on feet and tail; underparts buffy. Winter pelage duller than summer. Total length, males, 8.4 inches, females, 8.0; tail vertebræ, males, 3.0 inches, females, 2.9; hind foot, males, 1.12 inches, females, 1.10. Found in "Mountains

along west side of Sacramento Valley, Cal., from Sisson south to South Yolla Bolly Mountain." (Bailey)

Deschutes Pocket Gopher.—*Thomomys monticola nasicus* (Merriam).

Like typical *monticola* in size, with conspicuous large ears, and brighter color. Upperparts (summer) bright yellowish hazel; slaty on nose and about ears, whitish on feet, tail, and chin. Winter pelage not quite as bright as summer. Total length, males, 8.5 inches; tail vertebræ, 2.8 inches; hind foot, 1.1 inches. Found in "West-central Oregon (east of the Cascades), from Farewell Bend, Deschutes River, south to the Yamsey Mountains." (Bailey)

Heller Pocket Gopher.—*Thomomys monticola helleri* (Elliot). Resembling *mazama* but darker in color. Upperparts (winter) dull chestnut; ochraceous on sides, blackish on nose and face, intense black about ears; whitish on feet (sometimes mottled with white) and tip of tail. Total length, males, 8.1 inches, females, 7.8; tail vertebræ, males, 2.2 inches, females, 2.3; hind foot, males, 1.16 inches, females, 1.10. Found in "Coast region of southwestern Oregon." (Bailey)

Fuscus Group

Characterized by ears relatively small and pointed; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2).

Brown Pocket Gopher.—*Thomomys fuscus fuscus* (Merriam). Small in size; ears slender, pointed; feet slender; color light brown. Upperparts (summer) light brownish; slaty on nose, blackish about ear, dirty whitish on feet and tail; underparts buffy. Winter pelage duller in tone than summer. Total length, males and females, 8.1 inches; tail vertebræ, 2.2 inches; hind foot, 1.08 inches. Found in "South-eastern British Columbia, greater part of northern and central Idaho and western Montana, northwestern Wyoming, and parts of eastern Washington and Oregon." (Bailey)

Cœur D'Alene Pocket Gopher.—*Thomomys fuscus saturatus* Bailey.

Larger and darker than typical *fuscus*. Upperparts (summer) dark rich hazel; yellowish on sides, slaty on nose, black about ear, buffy gray on feet and tail; underparts washed with buffy, occasionally a small patch of white on chin or throat. Winter pelage unknown. Total length, males, 9.0 inches, females, 8.6; tail vertebræ, males, 3.1 inches, females, 2.9; hind foot, males, 1.20 inches, females, 1.16. Found in "Higher parts of the Cœur d'Alene Mountains in Idaho and Montana." (Bailey)

Alberta Pocket Gopher.—*Thomomys fuscus loringi* Bailey.

Resembling typical *fuscus*, slightly larger in size and duller in color, ear small and pointed. Upperparts (winter) dull

russet brown; warm buff on sides, slaty on nose, blackish about ear, dirty whitish on feet, pale buffy on tail; underparts washed with rich buffy over slate-colored underfur. Summer pelage a brighter shade of russet. Total length, males, 8.0 inches; tail vertebræ, 1.9 inches; hind foot, 1.06 inches. "Known only from Edmonton and Moose Mountain, Alberta." (Bailey)

Little-headed Pocket Gopher.—*Thomomys fuscus myops* (Merriam).

Similar to typical *fuscus* in coloration and character of small ears, but smaller in size. Upperparts (summer) light brownish; slaty on nose, blackish about ear, whitish on feet and tip of tail; underparts buffy, chin white (usually). Total length, males and females, 7.3 inches; tail vertebræ, 2.3 inches; hind foot, 1.0 inch. Found only near Conconully, Okanogan County, Washington.

West Coast Pocket Gopher.—*Thomomys hesperus* Merriam.

Small in size; ears small and pointed; color rich auburn. Upperparts bright rich auburn; dusky on nose and cheeks, black about ear, whitish on feet and tip of tail; underparts more nearly ochraceous. Total length, males, 8.4 inches; tail vertebræ, 2.4 inches; hind foot, 1.08 inches. Found in "Coast region of northwestern Oregon." (Bailey)

Townsendii Group

Characterized by large size (exceeded only by *bulbivorus*); dichromatic coloration (gray and black phases); mammae in four pairs (inguinal, 2-2; pectoral, 2-2).

Townsend Pocket Gopher.—*Thomomys townsendii townsendii* (Bachman).

Very large in size; ear small and pointed; claws medium; occurring in two color phases, dark gray and black. Upperparts (gray phase) dark buffy gray to sooty gray; blackish on nose, face, and about ear; lining of cheek-pouches black and white; soiled gray on feet and tail; underparts with washing of rich buff, chin white. Upperparts (black phase) dull slaty black; underparts like upperparts except for white patch on chin, toes, and generally on lower feet. Summer and winter pelages practically identical. Total length, males, 12.2 inches, females, 11.0; tail vertebræ, males, 4.0 inches, females, 3.0; hind foot, males, 1.5 inches, females, 1.4. Found in "Valley of Snake River in southern Idaho, from American Falls to Weiser." (Bailey)

Nevada Pocket Gopher.—*Thomomys townsendii nevadensis* (Merriam).

Resembling typical *townsendii* in large size, dichromatic coloration, but more buffy in gray phase and more slaty in black phase. Upperparts (gray phase) light buffy gray; slaty on nose and cheeks, pale buffy gray on feet and tail;

underparts pale buffy gray, throat white. Upperparts (black phase) bluish black to plumbeous; underparts like upper except for white on throat and usually on feet. Total length, males, 11.0 inches, females, 10.2; tail vertebræ, males, 3.6 inches, females, 3.3; hind foot, males, 1.5 inches, females, 1.4. Found in "Valleys of central and northern Nevada and southeastern Oregon, from Austin and Lovelocks, Nev., north to Alvord Lake, Oreg." (Bailey)

Subgenus *Megascapheus*

Characterized by large size; mammæ in four pairs (inguinal, 2-2; pectoral, 2-2); and by cranial characters.

Camas Pocket Gopher or Camas Rat.—*Thomomys bulbivorus* (Richardson). Plate XXVI.

Very large in size, largest species of the genus; claws of front feet relatively small and weak; external ears greatly reduced, a mere thickened rim; tail practically naked; color very dark. Upperparts (winter) dark sooty brown; blackish on nose and ears, white on feet (in streaks or blotches), chin, throat, and a small spot at base of tail below; underparts like upperparts, but with darker underfur showing through. Summer pelage like winter, but washed with rusty brown above and below. Total length, males, 12.0 inches, females, 10.8; tail vertebræ, males, 3.6 inches, females 3.2; hind foot, males, 1.7 inches, females, 1.6. Found in "Willamette Valley, Oreg., from Portland and Forest Grove south to Eugene; west to Grand Ronde." (Bailey)

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The Pocket Gopher is easily distinguished from other rodents by its fur-lined cheek-pockets, broad head, strong claws, and fossorial habit. The only other American rodents with external cheek-pockets are the Pocket Mice and Pocket Rats which have no such specializations for living an underground existence and bear little resemblance to Pocket Gophers.

The Western Pocket Gophers (*Thomomys*) differ from the Eastern Pocket Gophers of the Mississippi Valley (*Geomys*) in showing no very distinct grooving on the incisors; otherwise the two genera are very much alike superficially.

Pocket Gophers are abundant over much of western North America, and yet the animals themselves are seldom seen by the average observer. This is because the Gopher spends almost its entire existence underground and appears at the mouth of its burrow for only an instant, when it throws out

loose earth, or when it occasionally reaches out for clover or other food. These animals are clever engineers and drive their tunnels long distances. A single animal may construct a widespread labyrinth of subterranean passages, a great many feet in extent, during the course of a summer, where soil conditions are favorable. These burrows are driven to new feeding grounds, and the fresh earth thrown out every twenty-four hours proves that the Pocket Gopher is active and energetic.

Most of the digging is probably done with the foreclaws, but the incisors are used to some extent and are broad, capable tools. The burrows may be from a few inches to a foot or more below the surface, and frequent short laterals or "rises" are cut to the surface to get rid of the loosened earth. In contradistinction to the Mole which forces the earth to one side, displacing it by sheer strength, the Gopher cuts a clean burrow and brings all the debris to the surface, or to some unused part of the runway system. Where the soil is damp and loose and the animals can make new burrows without an excessive amount of labor, "gopher-hills" of fresh earth may be seen at intervals of 10 to 20 feet wherever one of these creatures is at work. A completed "hill" hides the mouth of the burrow, because the Gopher usually leaves a plug of soil in the last few inches of its length. Probably this is done to keep out snakes and other enemies. It has been stated that these animals have an aversion to light and plug up every opening to shut out light, but the reason just given seems more cogent. Sometimes close inspection reveals the outline of the burrow opening where the earth has issued, but more often the opening will be completely covered by a copious mound.

Short lateral burrows at which the Gopher is feeding are often without very much soil at the entrance, and the opening is closed between meals by only a thin plug which does not come quite flush with the surface. Such a spot may be revisited in an hour or two with a fair chance of seeing the occupant at work.

Much of the Gopher's food is secured below the surface as roots, bulbs, etc., but some is also taken immediately at the mouth of the burrow. The animal is loathe to leave the hole completely and stretches out only the forepart of its body, with the tail and hind quarters in the burrow, and is prepared

to dart back like a flash at the first sign of danger. The cheek-pockets are used for food storage, and animals taken feeding at the mouth of the burrow nearly always have the food in the pockets, showing that no time is taken to consume the vegetation as it is cut.

If one approaches an open burrow carefully it is possible to get quite close to a Pocket Gopher, for the animal's sight is poor. Vibration of the ground by careless steps will warn the Gopher instantly, and so will a breeze blowing from the observer toward the burrow, but if one stands motionless the Gopher will bring out earth or gather food at a distance of only a few feet from man. Earth is shoved up to the rim of the hole by the chest and forelegs of the Gopher and the animal appears for only an instant as a final push sends the load falling down the sides of the "gopher-hill." It goes back at once for more and may be gone for a minute or more, but is generally back in a few seconds. Unless unduly frightened, the Gopher will not go away for good and leave the burrow open, so as long as the entrance is open the observer can be sure the little digger will reappear soon. However, this animal is very cautious and I have been deceived more than once by a supposedly open burrow which a suspicious Gopher had plugged shortly after I began to watch it, but left the plug several inches below the surface of the ground where I would not see it until directly at the hole.

It is possible to catch a Gopher, when an open burrow is found, by putting an open noose about the hole and standing back with the end of the string until the head and shoulders of the Gopher appear. A twitch of the cord and one has a very angry captive, eager to bite and requiring careful handling. The Gopher disposition is surly and touchy, and, except during the mating season, full-grown animals never seem to be found more than one to a burrow.

Gophers which get into a garden are very destructive and the farmer will find them difficult to trap. The ordinary steel trap is filled and sprung with earth oftener than by the animal itself, but special Gopher traps have been devised which are more successful. It is necessary to clean out the burrows well when a trap is set, not only to remove earth which may be pushed into the trap, but to avoid warning the inmate that the runway has been tampered with. Finally, a board or

piece of sod should be placed over the top of the hole, clear of the trap, to shut out the light. Poisoned baits may also be used to rid gardens of these troublesome rodents.

Gophers have many enemies and in spite of everlasting vigilance are caught in great numbers by Hawks, Owls, and snakes, as well as by predatory mammals. Since Gophers are active day and night they run the gamut of all preying creatures, and momentary as is the appearance at the entrance of the burrow, Hawks and Owls seem to have no difficulty in catching them. Snakes enter the burrows and are certain of a meal.

The tail of the Gopher seems to possess an important tactile function and in narrow quarters, where the Gopher can not turn, the tail serves as a feeler when he runs backward.

One might expect that, since Gophers live underground to such an extent, there would be little variation in the color of the pelage. This is not the case, for the color of Gophers varies as much as that of Chipmunks or other rodents. Pocket Gophers have become distributed in very many different environments, practically everywhere where suitable food is to be found, and the color of the pelage varies accordingly from black to very light sandy gray. In general, the Pocket Gophers of the humid districts are dark-colored, and those of the deserts pale, as we should expect. There is a variation in size as well, from the very large *bulbivorous* of the Willamette Valley, where food is abundant, to the very small forms, such as *pygmaeus*, which live under more adverse conditions.

Pocket Gophers are active summer and winter. A winter pelage, in most forms fairly distinct from that of summer, is assumed and the new coat appears gradually, so that specimens may be taken which show both pelages. The replacement by the new fur creates a distinct line on the body of the animal, which usually follows a definite order beginning at the nose and head and then moving toward the base of the tail, until finally the pelage is all of one type and the line of differentiation disappears.

Pocket Gophers are prolific and have from four to eight young. The life-history of this group is not very well known, but there is evidence to show that, throughout much of the range of *Thomomys*, there are several litters of young a year.

Genus *Geomys* ¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

Eastern Pocket Gopher.—*Geomys tuza*
and related forms

General Description.—Externally so similar to *Thomomys* that no special description is needed. See genus *Thomomys*, page 269. Upper incisors deeply grooved. Plate XXVI.

Color.—Sexes colored alike; some seasonal variation.

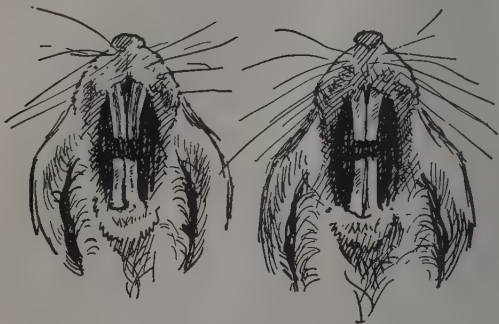


FIG. 60. Heads of Pocket Gophers to show incisor teeth.
Left, *Geomys*, right, *Thomomys*

Upperparts cinnamon-brown, with yellowish tinge, dorsal region slightly darker than sides; feet whitish; tail whitish; underparts dull buffy.

Immature duller than adults.

Measurements.—Males larger than females. Total length, males, 10.8 inches, females, 10 inches; tail vertebræ, males, 3.6 inches, females, 3.3 inches; hind foot, males, 1.4 inches, females, 1.3 inches.

Geographical Distribution.—Plains and prairies between the Mississippi River and the eastern foothills of the Rocky Mountains and the eastern Gulf States.

Food.—Same as for *Thomomys*, page 270.

Enemies.—Same as for *Thomomys*, page 270.

¹ For a revision of this genus see C. H. Merriam, *North America Fauna*, No. 8, 1895.

Species and Subspecies of the Genus *Geomys*

The geographical distributions given for the members of this genus are only provisional and will doubtless be considerably amended when the group is revised on the basis of present-day material.

Tuza Group

Georgia Pocket Gopher.—*Geomys tuza tuza* (Barton).

As described above. Found in "Pine barrens of Georgia (and probably northern Florida also), within the Austro-riparian faunal area." (Merriam)

Alabama Pocket Gopher.—*Geomys tuza mobilensis* Merriam.

Smaller than typical *tuza*, darker and tail shorter. Upperparts dark brown, with sepia tone; sides golden to deep buffy, sprinkled with black; dusky on top of head and along dorsal line as faintly-defined band; underparts washed with buffy, with some white about throat. Total length, males, 10 inches, females, 9.2 inches; tail vertebræ, males, 3.2 inches, females, 3 inches; hind foot, males, 1.34 inches, females, 1.2 inches. Found in "Southern Alabama and adjacent part of northwest Florida, within the Austroriparian Zone." (Merriam)

Florida Pocket Gopher or Salamander.—*Geomys floridanus floridanus* (Audubon and Bachman).

Resembling *tuza* but darker, tail more hairy and forefeet larger. Upperparts dull, dark slate-colored; sides brighter, with tinge of dull cinnamon; underparts washed with buffy, with some white on chin and throat. Total length, males, 11.5 inches, females, 9.5 inches; tail vertebræ, males, 3.8 inches, females, 3.1 inches; hind foot, males, 1.4 inches, females, 1.3 inches. Found in Florida in the St. Augustine region.

Southern Pocket Gopher.—*Geomys floridanus austrinus* Bangs.

Resembling typical *floridanus* in size but paler and more tawny. Upperparts pale cinnamon and tawny; sides ochraceous buff; underparts whitish to buffy, with large irregular patches of white on chin, inner sides of limbs and belly; hands, feet, and tail with scanty whitish hairs. Total length, males, 12 inches, females, 10 inches; tail vertebræ, males, 3.7 inches, females, 3.1 inches; hind foot, males, 1.47 inches, females, 1.3 inches. Found in the western part of the Florida peninsula.

St. Mary's Pocket Gopher.—*Geomys colonus* Bangs.

Resembling typical *tuza* in size but darker in color. Upperparts seal-brown to sepia; lower sides with light wash of cinnamon; underparts washed with cinnamon, pelage plumbeous at base, no white under chin; hands and feet whitish. Total length, males, 11.4 inches, females, 10 inches; tail vertebræ, males, 3.8 inches, females, 3.1 inches; hind foot,

males, 1.44 inches, females, 1.28 inches. Found in extreme southeastern Georgia in a restricted area between Crooked River on the north, Dark Entry Creek on the east, St. Mary's River on the south and Miller's Branch on the West.

Cumberland Island Pocket Gopher.—*Geomys cumberlandius* Bangs.

Size very large; tail long. Upperparts bright cinnamon to russet with well-defined, dark dorsal band; hands and feet grayish white; underparts washed with cinnamon, pelage plumbeous at base, irregular blotches of white under chin and on wrists. Total length, males, 12.8 inches, females, 11.2 inches; tail vertebræ, males, 4.3 inches, females, 3.8 inches; hind foot, males, 1.44 inches, females, 1.36 inches. Found only on Cumberland Island, Camden County, Georgia.

Bursarius Group

Shaw Pocket Gopher; Mississippi Valley Pocket Gopher.—*Geomys bursarius* (Shaw). Plate XXVI.

Large in size and dark in color. Upperparts dark brown to chestnut; forefeet white, hind feet dirty white; tail white, toward tip, brownish toward body; underparts lighter brown than upperparts. Total length, males, 11.9 inches, females, 10.6 inches; tail vertebræ, males, 3.6 inches, females, 3.1 inches; hind foot, males, 1.5 inches, females, 1.36 inches. Found in "Upper Mississippi Valley from a short distance south of the Canadian boundary southward to eastern Kansas, southeastern Missouri, and southern Illinois; east nearly to Lake Michigan, west in the Dakotas and Nebraska to the ninety-eighth or ninety-ninth meridian. Upper Sonoran and Transition Zones." (Miller)

Breviceps Group

Yellow Pocket Gopher.—*Geomys lutescens* (Merriam).

A pale, medium-sized species, with tail of medium length; scantily haired. Upperparts (summer) pale, dull yellowish to buffy ochraceous; underparts buffy; in winter drab above, with many black-tipped hairs along dorsal line to form dorsal band. Total length, males, 10.8 inches, females, 9.8 inches; tail vertebræ, males, 3.4 inches, females, 2.9 inches; hind foot, males, 1.34 inches, females, 1.26 inches. Found in "The Upper Sonoran belt of the Great Plains from southwestern South Dakota southward to Colorado, Texas, covering the sand-hill region of western Nebraska, extreme eastern Wyoming, western Kansas, eastern Colorado, western Oklahoma, and western Texas, ranging east to or a little beyond the ninety-ninth meridian." (Miller)

Louisiana Pocket Gopher.—*Geomys breviceps breviceps* Baird. Smaller than *lutescens*. Upperparts dark russet-brown; sides paler and yellower; tail naked except for dusky hairs

on basal portion; feet white; underparts washed with buffy, throat white. Total length, males, 9.2 inches, females, 8.5 inches; tail vertebræ, males, 2.8 inches, females, 2.5 inches; hind foot, males, 1.12 inches, females, 1.06 inches. Found in "The alluvial lowlands of the Mississippi Valley and Gulf coast of southern Arkansas, Louisiana, and Texas, and the valley of the Arkansas River; north nearly to southern Kansas, and west to near the ninety-eighth meridian. Austroriparian fauna." (Miller)

White-throated Pocket Gopher.—*Geomys breviceps sagittalis* Merriam.

Smaller than typical *breviceps* and more highly colored. Upperparts rich russet-brown with yellowish tinge, darkest along dorsal region and head, the latter almost black to the nose; forelegs and throat clear white; underparts varying from whitish to buffy. Total length, males, 8.8 inches, females, 7.8 inches; tail vertebræ, males, 2.6 inches, females, 2.2 inches; hind foot, males, 1.04 inches, females, .92 inch. Found on "Gulf coast of Texas about Galveston Bay." (Merriam)

Attwater Pocket Gopher.—*Geomys breviceps attwateri* Merriam.

Larger and paler than typical *breviceps*. Upperparts as in typical *breviceps*; underparts varying from soiled whitish to buffy. Total length, males, 10.2 inches, females, 8.8 inches; tail vertebræ, males, 3.2 inches, females, 2.5 inches; hind foot, males, 1.2 inches, females, 1.12 inches. Found on "Coastal plain and islands of Texas between Matagorda and Nueces Bays." (Merriam)

Mesquite Plains Pocket Gopher.—*Geomys breviceps llanensis* Bailey.

Larger and lighter colored than typical *breviceps*. Light liver-brown above, sometimes darker, back dusky; creamy to buffy white below. Males.—total length, 10.8 inches; tail vertebræ, 3.5 inches; hind foot, 1.3 inches; females.—total length, 9.2 inches; tail vertebræ, 3 inches; hind foot, 1.2 inches. Found in Texas "mainly along strips of sandy soil in the Llano, Colorado, Brazos, Red, and Canadian river valleys, in a region of scattered mesquite bushes. . . ." (Bailey)

Texas Pocket Gopher.—*Geomys texensis* Merriam.

Size very small for the genus; tail short, nearly naked for terminal third. Upperparts dark brown sprinkled with black; feet white; underparts whitish, except for a buffy collar about throat. Total length, 8.4 inches; tail vertebræ, 2.5 inches; hind foot, 1.12 inches. Found in "Mason County, central Texas, and probably thence southerly to the Rio Grande; limits of range unknown." (Merriam)

Sand Pocket Gopher.—*Geomys arenarius* Merriam.

A medium-sized, pale form with tail rather long and fairly well haired except at tip. Upperparts dull, pale brown sprinkled with black; feet white; underparts whitish.

Total length, males, 10.4 inches, females, 10 inches; tail vertebræ, males, 3.3 inches, females, 3.1 inches; hind foot, males, 1.3 inches, females, 1.24 inches. Found in "Valley of the Upper Rio Grande, from El Paso, in extreme western Texas, and Juarez, Chihuahua (on the Mexican side of the river opposite El Paso), north to Las Cruces, New Mexico, and west to Deming." (Merriam)

Padre Island Pocket Gopher.—*Geomys personatus personatus* True.

Large and pale; tail long, scantily haired on basal half, nearly naked toward tip. Upperparts dull, pale brown, with some black-tipped hairs; dusky on top of head; underparts whitish. Total length, males, 12.6 inches, females, 11.7 inches; tail vertebræ, males 4.5 inches, females, 4 inches; hind foot, males, 1.6 inches, females, 1.44 inches. Found in "The Tamaulipan fauna of Texas, comprising Padre Island and the adjacent mainland southwesterly to Carrizo on the Rio Grande." (Merriam)

Nueces Pocket Gopher.—*Geomys personatus fallax* Merriam.

Smaller than typical *personatus*, darker, and tail shorter and more nearly naked. Upperparts as in typical *personatus*; underparts white, with irregular, darker areas. Total length, males, 10.5 inches, females, 9.5 inches; tail vertebræ, males, 3.5 inches, females, 3 inches; hind foot, males, 1.36 inches, females, 1.24 inches. Found on "South shore of Nueces Bay and lower Nueces River, Texas." (Merriam)

Genus *Cratogeomys*

Very much like *Geomys*; upper incisors with single, median groove.

Chestnut-faced Pocket Gopher.—*Cratogeomys castanops castanops* (Baird).

Size large. Yellowish brown above, mixed with black-tipped hairs; underparts buffy; tip of tail blackish; feet grayish. Total length, 10.5 inches; tail vertebræ, 2.6 inches; hind foot, 1.5 inches. Found from southeastern Colorado, eastern New Mexico, and western Oklahoma south through western Texas into Mexico.

* * * * *

The Pocket Gophers of the genus *Geomys* and *Cratogeomys* do not differ very much in their general habits from *Thomomys* (see account of habits given for this genus, page 288).

These Pocket Gophers are found over practically all of the Mississippi Valley and may or may not prove troublesome to man, depending upon the locality. Some species are very destructive to fruit trees or to other cultivated vegetation; other species live in regions where the soil is too poor for cul-

tivation and are no economic problem. Areas which are otherwise adapted to Pocket Gophers are annually inundated and water is fatal to these subterranean rodents.

They store up food in underground storehouses and pile up more than they can consume. Sometimes the ploughman turns up a peck or two of small potatoes and roots of clover or fruit trees in a single one of these repositories. The serious damage done to orchards is due to the thoroughness with which the Pocket Gopher cuts up all of the smaller roots, taking not only what it can eat at the time, but removing a great mass that may never be eaten.

The Mississippi Pocket Gopher has from three to six young at a birth, the usual number being four or five, and the time of birth, in Illinois, has been given as April.

Family *Heteromyidæ*. Pocket Rats and Pocket Mice

Small rodents with external, fur-lined cheek-pockets; forefeet not equipped with greatly developed claws; hind legs more or less elongated; tail generally as long as head and body, often much longer; skull with elongated rostrum and inflated temporal region.

Genus *Liomys* ¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{8}{8}$ = 20.

Texas Spiny Mouse.—*Liomys irroratus texensis* (Merriam)

Names.—Texas Spiny Mouse; Texas Spiny Pocket Rat.

General Characters.—A large Mouse or small Rat with fur-lined cheek-pockets and pelage composed of normal hairs mingled with stiff bristles or spines which are flattened and grooved on anterior face; tail long, well haired; sole of hind foot hairy at heel and with five tubercles; ear of medium size, rounded. Nocturnal in habit, living in burrows in the ground.

Color.—Sexes colored alike.

¹ For a revision of this genus see E. A. Goldman, *North American Fauna*, No. 34, 1911.

Upperparts pale mouse-gray, head and back darker than sides, mixed with ochraceous buffy; a pale ochraceous buffy lateral line; feet white; forearms grayish on outer sides; tail above, dusky, below, white, tip dusky above and below; underparts white.

Measurements.—Sexes of equal size. Total length, 9.5 inches; tail vertebræ, 5 inches; hind foot, 1.2 inches.

Geographical Distribution.—From southern Texas south into Mexico, in lower Sonoran Zone on low plains. This genus is southern in its distribution and only the one form ranges far enough north to cross the Rio Grande.

Food.—Largely seeds. These are of great variety, chiefly of weeds and native flowering plants, but may include domestic grain such as wheat and corn. The diet is varied by small amounts of green vegetation and twigs.

Enemies.—Owls, Weasels, Foxes, Coyotes, Cacomistles.

* * * * *

Having had no experience with the North American Spiny Pocket Rats, I quote from Bailey, *Biological Survey of Texas*, North American Fauna, No. 25, 1905, page 127.

"Loring reports them at Brownsville as 'common in the timber under logs and the roots of trees;' and Lloyd says they are 'found at Lomita in the densest brush on the ridges forming the old banks of the river, and around old corrals.' He adds: 'Their habit of throwing out a white clayey mound like the gophers attracts attention, and, although the mound may be a month old, by cleaning out a hole and putting a trap in it you will in time capture the occupant. The ordinary outlets are generally covered up by fallen leaves, which in some instances seem to have been placed there by the occupants. They are strictly nocturnal in their habits, and feed on the seeds of hackberry, mesquite, and various other shrubs. Young and old inhabit the burrows together.'"

Genus *Perognathus* ¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

¹ For a revision of this genus see W. H. Osgood, *North American Fauna*, No. 18, 1900. Many forms have been described since this was written.

Pocket Mouse.—*Perognathus fasciatus*

and related forms

General Description.—A rather small Mouse with external fur-lined cheek-pockets; tail fairly long; hind legs long; ears small but not hidden in fur; nocturnal in habit. Plate XXVI.

Color.—Sexes colored alike; seasonal variation in color occurring, but not very marked.



FIG. 61. Pocket Mouse

Upperparts olive-gray finely mixed with black; sides like back; a buff lateral line from nose to end of tail; buffy about eye and ears; tail dusky above, buffy on sides, white below; pelage everywhere slate-colored at base; underparts clear white.

Immature duller than adults, slaty gray tinged with buff.

Measurements.—Sexes of approximately equal size, males slightly larger than females. Total length, 5.5 inches; tail vertebræ, 2.5 inches; hind foot, .68 inch.

Geographical Distribution.—Southwestern and mid-western North America.

Food.—Chiefly seeds.

Enemies.—Snakes, Owls, Weasels, Foxes, and small predatory mammals in general.

Species and Subspecies of the Genus *Perognathus*

Subgenus *Perognathus*

Characterized by small to medium size, soft normal pelage (no spines), soles of hind feet usually hairy.

Fasciatus Group

Maximilian Pocket Mouse.—*Perognathus fasciatus fasciatus* Wied. Plate XXVI.

As described above. Found in Upper Sonoran and Transition Zones of eastern Montana and Wyoming, east into the adjoining parts of North and South Dakota.

Buff-bellied Pocket Mouse.—*Perognathus fasciatus infraluteus* (Thomas).

Smaller than typical *fasciatus*, pelage not as soft, yellowish buff instead of white below. Total length, 5.1 inches; tail vertebræ, 2.2 inches; hind foot, .68 inch. Found in Larimer County, Colorado.

Sweetwater Pocket Mouse.—*Perognathus fasciatus litus* Cary. Slightly smaller than typical *fasciatus*, very pale in color, pelage very soft. Upperparts (September pelage) very



FIG. 62. Head of Pocket Mouse to show external cheek-pockets

pale cream buff, sparingly mixed with black; ring around eye, spot at base of ear, and lateral line pale cream buff; feet white; tail faintly bicolor, above slightly dusky, below, white; underparts clear white. Total length, 5.1 inches; tail vertebræ, 2.4 inches; hind foot, .72 inch. Found only in the lower Sweetwater Valley and adjacent parts of Red Desert, Wyoming.

Plains Pocket Mouse.—*Perognathus flavescens flavescens* (Merriam).

Similar to *fasciatus* but with harsher pelage and less olivaceous in color; upperparts light grayish buff mixed with dusky; tail indistinctly bicolor; feet and legs white. Total length, 5.2 inches; tail vertebræ, 2.5 inches; hind foot, .7 inch. Found in "Upper Austral plains of South Dakota, Nebraska, and Kansas; south possibly to northern Texas, and west to base of Rocky Mountains." (Osgood)

Cope Pocket Mouse.—*Perognathus flavescens copei* (Rhoads). Resembling typical *flavescens* but brighter in color. Upperparts fawn mixed with blackish, rump and thighs with strong wash of cinnamon; tail grayish white above, pure

POCKET MOUSE

white below. Total length, 4.6 inches; tail vertebræ, 2 inches; hind foot, .6 inch. Found in northern Texas, Wheeler County southwest to Ward County.

Dusky Pocket Mouse.—*Perognathus flavescens perniger* Osgood.

Very much like typical *flavescens* in size but much darker in color. Upperparts intense black to brownish black, sides and head mixed black and ochraceous buff; ears narrowly edged with buffy; a bright buffy spot at lower base of ear; a broad ochraceous buff lateral line; feet buffy; tail above, dusky, below, whitish; underparts rich ochraceous buff with white on chin and narrow stripe down throat and breast. Total length, 5.6 inches; tail vertebræ, 2.7 inches; hind foot, .72 inch. Found in southeastern South Dakota, Clay County; limits of range unknown.

Merriam Pocket Mouse.—*Perognathus merriami merriami* Allen.

Pelage softer than in *flavescens*; ears small, colors bright; tail scantily haired; sole of hind foot hairy on upper half. Upperparts ochraceous buff heavily sprinkled with black, darkest along dorsal region from nose to tail; sides brighter, more ochraceous; buff on ears and on spot behind ears; a white subauricular spot; black transverse stripes on nose; tail not sharply bicolor; underparts pure white. Total length, 4.7 inches; tail vertebræ, 2.3 inches; hind foot, .64 inch. Found in "Subtropical region of southern Texas and northeastern Mexico, and Lower Sonoran of central Texas. The known range extends from Alta Mira, Tamaulipas, northward to Washburn, Texas, and from this point southwestward to the vicinity of Roswell, N. Mex.; on the east it reaches San Antonio, and on the west follows up the Rio Grande as far as Comstock." (Osgood)

Dutcher Pocket Mouse.—*Perognathus merriami gilvus* Osgood. Slightly paler and yellower than typical *merriami* and pelage softer; somewhat larger. Total length, 4.8 inches; tail vertebræ, 2.3 inches; hind foot, .66 inch. Found in "Western Texas and southeastern New Mexico. Lower Sonoran Zone." (Osgood)

Baird Pocket Mouse.—*Perognathus flavus flavus* Baird.

Very small; pelage very soft; tail short, moderately haired; sole of hind foot hairy on upper half. Upperparts pinkish buff with light sprinkling of black, darkest on back; lateral line not sharply differentiated; a prominent buffy spot back of ear; tail almost concolor, slightly dusky above, pale buffy below; underparts pure white. Total length, 4.5 inches; tail vertebræ, 2 inches; hind foot, .6 inch. Found in "Upper and Lower Sonoran Zones from northeastern Colorado and western Nebraska to northern Mexico, extending westward into central Arizona and eastward to western Texas." (Osgood)

Cheyenne Pocket Mouse.—*Perognathus flavus piperi* Goldman.

Larger than typical *flavus* and with less intensely ochraceous upperparts. Upperparts light buff to light ochraceous buff, finely mixed with black, lateral line and spots at bases of ears pale but distinct; tail whitish above and below; underparts white. Total length, 4.6 inches; tail vertebræ, 2 inches; hind foot, .68 inch. Found "probably ranging at low elevations throughout eastern Wyoming and western South Dakota." (Goldman)

Yavapai Pocket Mouse.—*Perognathus flavus bimaculatus* (Merriam).

Resembling typical *flavus* but larger and somewhat darker on back; lateral lines more distinct. Total length, 4.7 inches; tail vertebræ, 2.1 inches; hind foot, .68 inch. Found in "Central and northeastern Arizona and southeastern Utah." (Osgood)

Sooty Pocket Mouse.—*Perognathus flavus fuliginosus* (Merriam).

Much darker than typical *flavus*; upperparts almost or quite black except for buff spots back of ears; underparts buff, throat and breast white. Total length, 4.6 inches; tail vertebræ, 2.3 inches; hind foot, .72 inch. Found on "Lava beds in the vicinity of San Francisco Mountain, Arizona." (Osgood)

Apache Pocket Mouse.—*Perognathus apache apache* Merriam.

Large in size, pelage soft, tail thinly haired, sole of hind foot hairy on upper three-fifths. Upperparts warm buff sprinkled with black; lateral line distinct; buff on ears and upperside of tail; underparts white. Total length, 5.6 inches; tail vertebræ, 2.7 inches; hind foot, .74 inch. Found in "Eastern Arizona, western New Mexico, and southern Utah." (Osgood)

Plateau Pocket Mouse.—*Perognathus apache cleomophila* Goldman.

Differing from typical *apache* in darker and richer color of upperparts. Upperparts ochraceous buff to tawny, mixed with black-tipped hairs; ears blackish inside, conspicuous white spots at bases of ears; feet white; lateral line clear ochraceous buff; tail above, brownish, below white; underparts white. Total length, 5.6 inches; tail vertebræ, 2.6 inches; hind foot, .8 inch. Found in the "Lava beds region east of San Francisco Mountain, Arizona." (Goldman)

Colorado Pocket Mouse.—*Perognathus apache caryi* Goldman.

Larger and darker than typical *apache*. Upperparts light ochraceous buff heavily mixed with black; ears as in *cleomophila*; lateral line broad and well defined, light ochraceous buff; tail above, grayish to brownish, below, white; underparts white. Total length, 6 inches; tail vertebræ, 2.9 inches; hind foot, .8 inch. Found in "Valleys of Grand River and other affluents of the Colorado River in western and southwestern Colorado." (Goldman).

Beautiful Pocket Mouse.—*Perognathus callistus* Osgood.

Smaller than *apache*. Upperparts grayish olive-buff, sprinkled with black; a distinct lateral line, cream buff; outside of ears whitish, inside dusky; a prominent creamy buff spot back of ear; tail dusky above, white below; underparts clear white. Total length, 5.4 inches; tail vertebræ, 2.5 inches; hind foot, .72 inch. Found in Sweetwater County, Wyoming.

Longimembris Group

Tejon Pocket Mouse.—*Perognathus longimembris longimembris* (Coues).

Size small; ears large; tail slightly longer than head and body, sparsely haired and pencilled; pelage soft; posterior third of soles haired. Upperparts yellowish brown finely mixed with dusky; lateral line clear yellowish brown; feet white; yellowish patch back of ear; tail buffy above and below, darker toward tip; underparts white. Total length, 4.8 inches; tail vertebræ, 2.5 inches; hind foot, .7 inch. Found in the vicinity of old Fort Tejon, Kern County, California; limits of range unknown.

Panamint Pocket Mouse.—*Perognathus longimembris panamintinus* Merriam.

Upperparts grayish buff sprinkled with dark-tipped hairs; an indistinct pale buff lateral line; forelegs buffy to white; dusky on upperside of tail, especially at tip; underparts white. Total length, 5.7 inches; tail vertebræ, 3.1 inches; hind foot, .78 inch. Found in "Panamint Mountains, California, and eastward through southern Nevada to St. George, Utah." (Osgood)

Bangs Pocket Mouse.—*Perognathus longimembris bangsi* Mearns.

Smaller and paler than *panamintinus*. Upperparts pale vinaceous buff lightly sprinkled with black; lateral line indistinct; underparts white, including feet and forelegs. Total length, 5.5 inches; tail vertebræ, 3.2 inches; hind foot, .76 inch. Found in "Desert valleys of southern and southeastern California, Lower Sonoran Zone." (Osgood)

Perognathus pericalles Elliot = *Perognathus longimembris bangsi*, according to Grinnell.

San Felipe Pocket Mouse.—*Perognathus longimembris arenicola* (Stephens).

Resembling *bangsi* but paler and whiter. Total length, 5.6 inches; tail vertebræ, 3.3 inches; hind foot, .76 inch. Found in San Diego County, California, region about San Felipe Narrows. (Said by Grinnell to be a synonym of *bangsi*)

Short-nosed Pocket Mouse.—*Perognathus longimembris brevinasus* (Osgood).

Similar to *panamintinus* but darker, tail shorter. Upperparts pinkish buff mixed with black; pelage of back, espe-

cially rump, usually buff to roots; well-defined, transverse, blackish nose stripes. Total length, 5.2 inches; tail vertebræ, 2.5 inches; hind foot, .74 inch. Found in "a few scattered localities in extreme southwestern California. Upper Sonoran Zone." (Osgood)

Yuma Pocket Mouse.—*Perognathus bombycinus* Osgood.

Resembling *bangsi* in size and color. Upperparts pale vinaceous buff sparingly mixed with dusky; well-developed white spot at anterior base of ear; ears edged with whitish; underparts white. Total length, 5.4 inches; tail vertebræ, 3.2 inches; hind foot, .74 inch. Found from Yuma County, Arizona, west into Imperial County, California, south into Mexico.

Nevada Pocket Mouse.—*Perognathus nevadensis* Merriam.

Resembling *panamintinus* but smaller, darker, and underparts colored like sides. Total length, 5.3 inches; tail vertebræ, 2.9 inches; hind foot, .75 inch. Found in "Upper Sonoran Zone of central Nevada; northward to southern Oregon and northern Utah." (Osgood)

Pacific Pocket Mouse.—*Perognathus pacificus* Mearns.

Smallest of the genus; pelage very soft; color similar to that of *brevinasus*. Upperparts pinkish buff sprinkled with black; tail nearly unicolor; ears dusky; underparts white. Total length, 4.5 inches; tail vertebræ, 2.1 inches; hind foot, .6 inch. Found only near Mexican boundary monument No. 258, shore of Pacific Ocean, San Diego County, California.

Loring Pocket Mouse.—*Perognathus amplus* Osgood.

Size large; tail long; sole of hind foot naked for lower four-fifths; pelage long and soft. Upperparts pinkish buff lightly marked with black; buff lateral line wide and distinct; tail buff, mixed with black above; underparts white. Total length, 6.2 inches; tail vertebræ, 3.2 inches; hind foot, .8 inch. Found near Fort Verde, Yavapai County, Arizona.

San Joaquin Pocket Mouse.—*Perognathus inornatus inornatus* Merriam.

Size of *apache*, pelage rather harsh, sole of hind foot hairy on upper third. Upperparts buff, mixed with black; lateral line indistinct; ear buffy outside, dusky inside, a white spot at base; buff on upperside of forelegs and on tail; underparts white. Total length, males, 5.8 inches, females, 5.4 inches; tail vertebræ, males, 3 inches, females, 2.8 inches; hind foot, males, .75 inch, females, .73 inch. Found in the vicinity of San Joaquin Valley, California.

McKittrick Pocket Mouse.—*Perognathus inornatus neglectus* (Taylor).

Larger than typical *inornatus*. Upperparts ochraceous buff with very little admixture of black; feet and underparts pure white. Total length, 6.2 inches; tail vertebræ, 3 inches; hind foot, .84 inch. Found in Lower Sonoran Zone of Kern and San Luis Obispo Counties, California.

Parvus Group

Oregon Pocket Mouse.—*Perognathus parvus parvus* (Peale).

Large in size; tail long and slightly tufted; ears medium; sole of hind foot hairy on upper fourth; occurring in two color phases, with intermediates. Gray phase: upperparts pale slaty buff sprinkled with black; sides paler than back; lateral line buff; tail above dusky, laterally buff, below white. Underparts white, belly darker. Buff phase like gray, but general tone buffy. Total length, 6.8 inches; tail vertebræ, 3.6 inches; hind foot, .9 inch. Found in "Valley of the Yakima River, Washington, and thence southward to central and southeastern Oregon. Upper Sonoran Zone." (Osgood)

Idaho Pocket Mouse.—*Perognathus parvus idahoensis* Goldman.

Large; darkest of the subspecies of *parvus*. Upperparts light vinaceous buff heavily mixed with black, especially dark on lower back which is blackish; lateral line almost clear buffy; ears blackish with conspicuous white spots at base; tail above, mixed black and buffy, nearly black at tip, below, pale buffy; underparts dull whitish on chin, throat, and inner sides of forearms, light ochraceous buff on belly and insides of hind limbs; heels black. Total length 7.5 inches; tail vertebræ, 4 inches; hind foot, .96 inch. Found only near Arco, Blaine County, southern Idaho; limits of range unknown.

Coues Pocket Mouse.—*Perognathus parvus mollipilosus* (Coues).

Smaller than typical *parvus*; ears larger; markings more intense; coloration darker. Upperparts warm ochraceous buff, liberally sprinkled with black; a distinct lateral line; underparts white, belly tawny. Total length, 6.7 inches; tail vertebræ, 3.5 inches; hind foot, .9 inch. Found in "Great Basin extension of northeastern California, north to Klamath Basin, Oregon. Upper Sonoran Zone, except on Mount Shasta, where it ascends to the Boreal." (Osgood)

Great Basin Pocket Mouse.—*Perognathus parvus olivaceus* (Merriam).

Resembling typical *parvus* but pelage softer and lighter in color. Upperparts bright cinnamon-buff; finely sprinkled with black; lateral line and spot below ear conspicuous; underparts white, belly sometimes buffy. Total length, males, 7 inches; tail vertebræ, 3.8 inches; hind foot, .88 inch. Found in "Upper Sonoran Zone throughout the Great Basin, from northern Utah and southern Idaho southwest to Owens Valley, California, and west to southern Oregon and northeastern California." (Osgood)

Uinta Pocket Mouse.—*Perognathus parvus clarus* Goldman.

Somewhat larger than typical *parvus* and paler in color.

Upperparts light buff faintly sprinkled with black; white spots at bases of ears well developed; buffy lateral line faintly developed; tail above, brownish, below, whitish; underparts white. Total length, 7 inches; tail vertebrae, 3.6 inches; hind foot, .88 inch. Found in "Green River Valley in southwestern Wyoming, and upper part of Snake River Valley, in southeastern Idaho." (Goldman)

Mount Magruder Pocket Mouse.—*Perognathus parvus magruderensis* Osgood.

Colored like *olivaceus* but larger. Total length, 7.8 inches; tail vertebrae, 4.1 inches; hind foot, 1.0 inch. Found in "Upper Sonoran and Transition Zones of the desert ranges of southern Nevada and adjoining portion of California." (Osgood)

Walker Pass Pocket Mouse.—*Perognathus xanthonotus* Grinnell.

Somewhat like *olivaceus* but smaller. Upperparts ochraceous buff to cream buff, slightly darkened on dorsal region with black-tipped hairs, sides clearer buff; ears, inside and out, sparsely clothed with white hairs; white spot at base of ear conspicuous; tail pencillate, above cream buff, darker toward tip, below white; feet white; underparts white. Total length, 6.8 inches; tail vertebrae, 3.4 inches; hind foot, .9 inch. Found in the tree yucca belt, between Upper and Lower Sonoran Zones, at the southern end of the Sierra Nevada, Kern County, California.

White-eared Pocket Mouse.—*Perognathus alticola* Rhoads.

Resembling *olivaceus* but slightly smaller. Color as in *olivaceus*; lateral line indistinct, ears white inside and out. Total length, 6.6 inches; tail vertebrae, 3.5 inches; hind foot, .88 inch. Found only in San Bernardino Mountains, San Bernardino County, California.

Northwest Pocket Mouse.—*Perognathus lordi lordi* (Gray).

Resembling *parvus* in the gray phase; size large; tail long; color dark. Upperparts pale slaty buff, with heavy mixture of black; tail as in *parvus*; underparts buffy with white spots on pectoral and inguinal regions. Total length, 7.3 inches; tail vertebrae, 3.9 inches; hind foot, .92 inch. Found in "Upper Sonoran and Transition Zones of the plains of the Columbia River, Washington, and suitable adjacent territory in southern British Columbia." (Osgood)

Columbian Pocket Mouse.—*Perognathus lordi columbianus* (Merriam).

Differing from typical *lordi* in slight cranial characters; color as in typical *lordi*. Total length, 7.2 inches; tail vertebrae, 3.7 inches; hind foot, .9 inch. Found in vicinity of Pasco, Franklin County, Washington.

Formosus Group

Long-tailed Pocket Mouse.—*Perognathus formosus* Merriam. Size large; tail long and tufted; ears large; soles of hind feet naked. Upperparts grizzled sepia; sides like back; ears

blackish; spot below ear indistinct; feet white; tail mixed buff and dusky above, darker at tip, below buffy; underparts white. Total length, 7.6 inches; tail vertebræ, 4.2 inches; hind foot, .96 inch. Found in "Southwestern Utah, southern Nevada, and the adjoining portion of California. Lower Sonoran Zone." (Osgood)

Perognathus mesembrinus Elliot = *Perognathus formosus* according to Grinnell.

Subgenus *Chætodipus*

Characterized by medium to large size, harsh or spiny pelage, naked soles of hind feet.

Baileyi Group

Bailey Pocket Mouse.—*Perognathus baileyi baileyi* Merriam.

Very large with long, tufted tail, colored like *formosus*. Upperparts grizzled grayish buff; underside of tail whitish. Total length, 8.6 inches; tail vertebræ, 4.8 inches; hind foot, 1.1 inches. Found in "South central Arizona and thence south into Sonora and northern Lower California, Mexico." (Osgood)

Hispidus Group

Hispid Pocket Mouse.—*Perognathus hispidus hispidus* Baird.

Size large; pelage harsh but not spiny; tail about as long as head and body; soles of hind feet naked medially. Upperparts mixed ochraceous and black; sides almost as dark as back; lateral line distinct, ochraceous; ears inside dusky, buffy white on margins and outer sides; tail bicolor, black above, whitish below; feet white; underparts white. Total length, 8.2 inches; tail vertebræ, 4 inches; hind foot, 1.0 inches. Found in "Southern and western Texas, north to Oklahoma and south into border States of Mexico. Lower Sonoran Zone." (Osgood)

Kansas Pocket Mouse.—*Perognathus hispidus paradoxus* (Merriam).

Like typical *hispidus* but larger and with softer pelage; color duller and paler. Total length, 9 inches; tail vertebræ, 4.3 inches; hind foot, 1.06 inches. Found in "Upper Sonoran Zone of the Great Plains from the Dakotas to Texas, westward to base of Rocky Mountains." (Osgood)

Oklahoma Pocket Mouse.—*Perognathus hispidus maximus* Elliot.

Resembling typical *hispidus* but larger in size and brighter in color. Upperparts ochraceous heavily mixed with black, face without so much black; lateral line bright ochraceous buff; inside of ear dusky, outside buffy; feet white; tail above blackish brown, below white, sides buffy; underparts

white. Total length, 9.6 inches; tail vertebræ, 4.4 inches; hind foot, 1.1 inches. Found in Cleveland County, Oklahoma; limits of range unknown.

Penicillatus Group

Desert Pocket Mouse.—*Perognathus penicillatus penicillatus* Woodhouse.

Size large; tail long, crested, tufted; sole of hind foot naked to heel; pelage somewhat soft, no spines on rump; markings reduced, color uniform. Upperparts vinaceous buff sprinkled with black; sides like back, no lateral line; no conspicuous markings on face or head; tail above, dusky, below, white to tuft; underparts white. Total length, 8.2 inches; tail vertebræ, 4.4 inches; hind foot, 1.0 inches. Found in "Vicinity of Colorado River from Bunkerville, Nevada to Yuma, Arizona. . . . Lower Sonoran Zone." (Osgood)

California Desert Pocket Mouse.—*Perognathus penicillatus angustirostris* Osgood.

Colored like typical *penicillatus* but smaller. Total length, 7.3 inches; tail vertebræ, 4.1 inches; hind foot, .96 inch. Found in "Colorado Desert; south to northern Lower California and east to the Colorado River and southwestern Arizona, where it meets the range of *penicillatus* and *pricei*. Lower Sonoran Zone." (Osgood)

Price Pocket Mouse.—*Perognathus penicillatus pricei* (Allen). Resembling typical *penicillatus* but smaller, pelage harsher, more black on upperparts. Total length, 6.9 inches; tail vertebræ, 3.7 inches; hind foot, .9 inch. Found in "South central Arizona and Northwestern Mexico, west of the Sierra Madre." (Osgood)

Eastern Desert Pocket Mouse.—*Perognathus penicillatus eremicus* (Mearns).

Similar to *pricei* but paler and with softer pelage. Upperparts fawn, lightly sprinkled with black; faint spot at base of whiskers; prominent dark area below ears. Total length, 6.5 inches; tail vertebræ, 3.3 inches; hind foot, .88 inch. Found in "Extreme western Texas, thence south into north central Mexico east of the Sierra Madre at least to La Ventura, Coahuila." (Osgood)

Stephens Pocket Mouse.—*Perognathus stephensi* Merriam.

Resembling *penicillatus* but very much smaller, very little black in pelage. Upperparts uniform pinkish to vinaceous buff; underparts white. Total length, 7.1 inches; tail vertebræ, 3.8 inches; hind foot, .84 inch. Found in "Mesquite Valley, northwest arm of Death Valley, Inyo County, Cal." (Osgood)

Intermedius Group

Intermediate Pocket Mouse.—*Perognathus intermedius intermedius* Merriam.

Size medium; color dark; markings well defined; weak spines

on rump. Upperparts drab mixed with black; sides paler than back; narrow lateral line, pale fawn; dusky on ears and upperside of tail; tail blackish at tip, white on underside, buffy on sides; underparts white with faint buffy wash. Total length, 7.2 inches; tail vertebræ, 4.1 inches; hind foot, .90 inch. Found in "several scattered localities in the Sonoran Zone of Arizona, New Mexico, and northern Mexico." (Osgood)

Gila Pocket Mouse.—*Perognathus intermedius phasma* Goldman.

Smaller and decidedly paler than typical *intermedius*. Upperparts light buff to pale ochraceous buff thinly mixed with black on top of head and back, less black on cheeks, sides, and hips; tail above, brownish, below white, pencil brownish above and below; underparts white. Total length, 6.6 inches; tail vertebræ, 3.9 inches; hind foot, .82 inch. Found in "Desert mountains of extreme southwestern Arizona and doubtless adjacent parts of Sonora, Mexico." (Goldman)

Short-eared California Pocket Mouse.—*Perognathus fallax fallax* Merriam.

Slightly larger than typical *intermedius*, darker; rump spines heavier. Upperparts bister mixed with black; lateral line pinkish buff; ears of medium size; tail bicolor; underparts creamy white. Total length, 7.7 inches; tail vertebræ, 4.2 inches; hind foot, .92 inch. Found in "Extreme southwestern California, occupying the region west of the San Bernardino and San Jacinto ranges and extending south into northern Lower California." (Osgood)

Pallid Pocket Mouse; Pallid Short-eared Pocket Mouse.—*Perognathus fallax pallidus* Mearns.

Very close to typical *fallax* in size but paler above; pelage of upperparts light gray at base instead of dark gray; upperparts with less mixture of black, lateral line pale pinkish buff; upperside of tail drab; underparts creamy white. Total length, 7.8 inches; tail vertebræ, 4.3 inches; hind foot, .96 inch. Found in California in the Lower Sonoran Zone on the "east slope of main mountain divides in San Diego, Riverside, and San Bernardino Counties." (Grinnell)

Californicus Group

Great California Pocket Mouse.—*Perognathus femoralis femoralis* Allen.

Size very large; tail long, crested, tufted; ears large and elongate; pelage harsh, spines on rump and flanks; color dark. Upperparts bister, heavily mixed with intense black; rich buffy lateral line; tail bicolor; underparts soiled whitish, with or without buffy suffusion. Total length, 9.0 inches; tail vertebræ, 5.0 inches; hind foot, 1.1 inches. Found in "a few localities in San Diego County, in extreme south-

ern California, and the adjoining part of Lower California." (Osgood)

California Pocket Mouse.—*Perognathus californicus californicus* Merriam.

Smaller than typical *femorialis*, but similar to it in characters of large ear and spiny rump and flanks. Color about as in *femorialis*. Total length, 7.7 inches; tail vertebræ, 4.1 inches; hind foot, .96 inch. Found in "Vicinity of San Francisco Bay and south to Bear Valley, San Benito County, where it meets the range of its subspecies *dispar*." (Osgood)

Allen Pocket Mouse.—*Perognathus californicus dispar* Osgood.

Resembling typical *californicus* but pelage softer, larger, and paler. Upperparts bister; lateral line pinkish buff; tail bicolor; underparts buffy white. Total length, 8.5 inches; tail vertebræ, 4.7 inches; hind foot, 1.04 inches. Found in "Coast valleys of California from San Bernardino to San Benito County and north along the foothills of the west slope of the Sierras to Placer County." (Osgood)

Kern Pocket Mouse.—*Perognathus californicus ochrus* Osgood.

Resembling *dispar* but much paler. Upperparts pinkish buff mixed with dusky to produce general effect of ecru drab; lateral line pale pinkish buff; feet white; tail above, light brown, below, white; underparts creamy white. Total length, 8.5 inches; tail vertebræ, 4.5 inches; hind foot, 1 inch. Found in California in the "Lower Sonoran Zone in the southern San Joaquin Valley, west to Cuyama Valley and north to Alcalde, Fresno County." (Grinnell)

Spinatus Group

Spiny Pocket Mouse.—*Perognathus spinatus spinatus* (Merriam).

Size medium; pelage harsh, with large conspicuous spines on rump and scattering on flanks and sides as far as shoulders; tail of medium length, crested; ears small and rounded; lateral line reduced or absent. Upperparts drab brown, hairs black-tipped; sides lighter than back; ears dusky; tail pale brown above, whitish below; underparts buffy white. Total length, 7.2 inches; tail vertebræ, 4 inches; hind foot, .88 inch. Found in "Desert region of southern California and northern Lower California." (Osgood)

* * * * *

The Pocket Mice are beautiful little rodents well characterized by their mouse size and their external, hair-lined cheek-pockets. The only other North American rodents with external cheek-pockets are much larger (rat size), and will not be confused with *Perognathus*.

These Mice are dwellers on the plains or deserts and are never found in dense forests, although they do occur, to some

extent, in dry, open forests in the Southwest. They are burrowing Mice and are found in greatest abundance where loose soil or sand makes burrow construction easy. The burrows are made only as homes and the Pocket Mice come forth at night to run about like other Mice, not spending the greater part of their existence underground like another pocketed rodent, the Pocket Gopher.

Pocket Mice are strictly nocturnal and over much of the range, of the group this habit is a decided advantage. Although a few forms reach well up on the cooler prairies, the group is typically Sonoran in its distribution, and the greatest number of species is found on hot, arid plains or stark desert tracts where a hot sun makes daylight activity a heavy drain upon mammal activity. Some of the mammals of these areas are diurnal and withstand heat and dryness successfully, but *Perognathus* avoids these features by coming out only after sundown. Most of the Pocket Mice are also of light coloration, sandy grays or light browns and buffs, which is an adaptation to desert conditions.

The presence of Pocket Mice is usually easily detected by their burrows and their paths or runways over the sand. In a grassy country these may not be so obvious, but in sandy, desert sections the mouse "sign" is conspicuous. The burrows are often plugged with sand a short distance in from the entrance to keep out snakes, light, or heat, perhaps all external disturbances. These Mice are rather social in habit and a hummock of sand may be honeycombed by interior workings, with several external openings. Tracks radiating out from the holes indicate the presence of several animals and inspection each morning will show that there has been great activity the night before.

The cheek-pouches are used for storing seeds and hold a very sizable collection. The animal picks up seeds and grains of all sizes, some of which are very tiny, and carries them to an underground storehouse. Despite the fact that most of the food these Mice eat is very dry, they are capable (at least the desert species are) of going indefinitely without water. Pocket Mice are easily tamed and make interesting pets, although because of their nocturnal habits they are difficult to observe.

The number of young varies from four to seven but is usu-

ally four or five. Several litters may be raised in a year over most of the range of the genus, although the northern forms probably rear but one family a season.

While most of the species of Pocket Mice are common mammals in their respective ranges, there are forms of this genus which are among the rarest of the North American rodents. For some unknown reason the distribution of these particular creatures is very local and only at long intervals are specimens taken. Such a form is the Pacific Pocket Mouse, *Perognathus pacificus*, one of the smallest of rodents.

Genus *Dipodomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20

Kangaroo Rat.—*Dipodomys agilis*

and related forms

Names.—Kangaroo Rat; Pocket Rat. Plate XXVI.

General Description.—A small Rat with elongated hind legs and short forelegs; hallux greatly reduced or absent; long, tufted tail; rather robust body; large head; large eyes; rounded ears; external, fur-lined cheek-pockets; long, soft pelage; distinctive and attractive color pattern; progression by means of kangaroo-like hops, the small forelegs not touching the ground; hind feet and toes furred on under surface; nocturnal in habit.

Color.—Sexes colored alike; seasonal variation not very great.

Upperparts.—Dusky cinnamon-buff; sides clearer in tone than back and meeting white of underparts in a sharp line; pelage slate-gray basally; blackish patch at base of whiskers on each side, joined over the nose by a dusky crescentic bar; eyelids blackish; buffy white area between eye and dark whisker-patch, and a light spot over eye; a silky white patch of hairs semi-concealed at posterior base of ear; ear blackish brown, with white spot at anterior base; longer whiskers blackish, shorter whiskers whitish; thigh marked by a sharp band of

¹ No recent revision of this genus has been published, but the reader is referred to *A Geographical Study of the Kangaroo Rats of California* by Joseph Grinnell, Univ. of California Publication in Zoology, Vol. 24, No. 1, pp. 1-124, 1922. This paper gives full data on more than half of the forms treated in this handbook.

KANGAROO RAT

white which is continuous with white of underparts; tail marked by four sharply distinct stripes, a blackish dorsal and a blackish ventral stripe, and two white lateral stripes;



FIG. 63. Kangaroo Rat

a white ring at base of tail; a dark brownish tuft on end of tail; feet white; blackish stripe on plantar surface.

Underparts.—pure white.



FIG. 64. Head of Kangaroo Rat to show external cheek-pockets

Immature pelage very much like that of adults, but grayer above and lacking some of the bright color tones.

Measurements.—Sexes of equal size. Total length, 11.7 inches; tail vertebræ, 7.2 inches; hind foot, 1.7 inches.

Geographical Distribution.—Warmer zones of western North America.

Food.—Principally seeds, and some grains; green foliage sometimes eaten.

Enemies.—Snakes, Owls, Foxes, Coyotes, Weasels, Badgers, Bobcats, and other small carnivores.

Species and Subspecies of the Genus *Dipodomys*

The pattern of coloration as just described is quite constant throughout the genus, most of the variation being in color or intensity of shade, size, presence or absence of the "great" toe, and in cranial characters.

Agilis Group

Gambel Kangaroo Rat.—*Dipodomys agilis agilis* Gambel.

As described above, normally five-toed. Found in "Southern California, almost altogether on its Pacific slope, from northern Santa Barbara County southeast through Ventura, Los Angeles and Orange counties into western San Bernardino and western Riverside counties as far as the San Bernardino and San Jacinto mountains. Altitudinal range, close to sea-level up to 7500 feet. Life-zone, chiefly Upper Sonoran, but extends locally up into Transition and down into Lower Sonoran." (Grinnell) Plate XXVI.

Dulzura Kangaroo Rat.—*Dipodomys agilis simulans* (Merriam).

Resembling typical *agilis* but smaller and darker in general coloration. Upperparts dusky pinkish cinnamon. Total length, 11.4 inches; tail vertebræ, 6.9 inches; hind foot, 1.7 inches. Found on "The Pacific slope of San Diego County, probably extending south into Lower California. Altitudinal range, from sea-level up to 3000 feet. Life-zone, Upper Sonoran, ranging locally down into Lower Sonoran." (Grinnell)

Cabazon Kangaroo Rat.—*Dipodomys agilis cabazonæ* (Merriam).

Smaller than typical *agilis*, with dark markings reduced, and paler in coloration. Upperparts light pinkish cinnamon. Total length, 11.3 inches; tail vertebræ, 6.8 inches; hind foot, 1.7 inches. Found on "The desert slopes of the coastal mountains of southern California, from Cabazon, Riverside County, south through eastern San Diego County to, and probably beyond, the Mexican line. Altitudinal range, 1700–3500 feet. Life-zone, Upper Sonoran and upper edge of Lower Sonoran." (Grinnell)

Walker Basin Kangaroo Rat.—*Dipodomys agilis perplexus* (Merriam).

Larger than typical *agilis*, with larger ear and paler coloration. Upperparts with less dusky on sides and facial areas. Total length, 12.1 inches; tail vertebræ, 7.4 inches; hind foot, 1.8 inches. Found in "The mountain ranges and included valleys lying around the southern end of the San Joaquin Valley. Recorded from Trout Creek, toward head of South Fork of Kern River, in Tulare County, southwest through the Tehachapi and Tejon country to head of Piru Creek, in Ventura County. Altitudinal range, 2400 to 6500 feet. Life-zone, Upper Sonoran." (Grinnell)

Santa Cruz Kangaroo Rat.—*Dipodomys venustus venustus* (Merriam).

Similar to *agilis* but darker; ear larger; tail longer. Upperparts cinnamon-brown; sides paler. Total length, 12.6 inches; tail vertebræ, 7.8 inches; hind foot, 1.84 inches. Found in "Chiefly the Santa Cruz Mountain region, in other words the area south from San Francisco to Monterey Bay and lying west of the Santa Clara Valley and the south arm of San Francisco Bay; but the race also occurs, east of the Santa Clara Valley, on Mount Hamilton, and southeast to northern end of Gabilan Range. Altitudinal range, from near sea-level to at least 4000 feet. Life-zone, Upper Sonoran, entering the Transition locally." (Grinnell)

Santa Lucia Mountain Kangaroo Rat.—*Dipodomys venustus sanctiluciae* (Grinnell).

Resembling typical *venustus* but slightly paler and less deeply cinnamon on dorsal area. Total length, 12.1 inches; tail vertebræ, 7.2 inches; hind foot, 1.8 inches. Found in "The Santa Lucia Mountain region, namely the mountainous area of west-central California lying between the Salinas Valley and the seacoast, and between Monterey Bay and San Luis Obispo. Altitudinal range, 900 to 5900 feet. Life-zone, Upper Sonoran, entering the Transition locally." (Grinnell)

Elephant-eared Kangaroo Rat.—*Dipodomys elephantinus* (Grinnell).

Size large; ears very large; tail long; toes five in number; color most like *perplexus*. Total length, 13 inches; tail vertebræ, 7.9 inches; hind foot, 1.85 inches. Found on "The chaparral-covered slopes of the southern part of the Gabilan Range, in the vicinity of the Pinnacles, in San Benito and Monterey counties. Altitude of occurrence so far as yet known, about 1300 feet. Life-zone, Upper Sonoran." (Grinnell)

Microps Group

Small-faced Kangaroo Rat.—*Dipodomys microps microps* (Merriam).

Size small; face narrow; ears small; toes five in number;

pale buffy in coloration; dark markings reduced. Total length, 10.5 inches; tail vertebræ, 6 inches; hind foot, 1.64 inches. Found in "Owen's Valley north from Olancho nearly to Benton, Mono County; also the Mohave Desert in the vicinity of Victorville, San Bernardino County. Altitudinal range, 2700-7700 feet. Life-zone, Lower Sonoran; reaches into lower edge of Upper Sonoran locally." (Grinnell)

Preble Kangaroo Rat.—*Dipodomys microps preblei* (Goldman).

Color darker than in typical *microps* or in *levipes*. Upperparts near pinkish cinnamon, finely sprinkled with black. Total length, 10.5 inches; tail vertebræ, 6.2 inches; hind foot, 1.64 inches. Found in "Plains regions of southeastern Oregon and northwestern Nevada." (Goldman)

Light-footed Kangaroo Rat.—*Dipodomys levipes* (Merriam).

Size medium; face narrow; ear small; toes five in number; coloration dusky in tone; dark markings well developed. Total length, 11 inches; tail vertebræ, 10.3 inches; hind foot, 1.7 inches. Found in "Territory of moderate altitude lying east of Owens Valley, and extending north into Nevada; westernmost station, Olancho, Inyo County; southernmost, head of Emigrant Cañon, Panamint Mountains, Inyo County. Altitudinal range, 3600-5300 feet. Life-zone, Lower Sonoran in its upper portion." (Grinnell)

Deserti Group

Big Desert Kangaroo Rat.—*Dipodomys deserti deserti* Stephens.

Size very large; toes four in number; general coloration very pale; tail white-tipped and without dark ventral stripe; dark facial markings absent; sole of hind foot without dark stripe; pelage very long and silky. Upperparts pale ochraceous buffy, with very faint dusky wash. Total length, 13.7 inches; tail vertebræ, 8 inches; hind foot, 2.1 inches. Found in "(in California).—The Colorado and Mohave desert regions, from the Mexican line north to Death Valley and through Owens Valley on east side at least to Alvord, Inyo County (Stephens, 1906, p. 156); west on Colorado Desert to Borego Spring, in eastern San Diego County, and to Palm Springs and Whitewater, Riverside County, and on Mohave Desert to vicinity of Hesperia, San Bernardino County, and Olancho, Inyo County. Altitudinal range,—200 to 3900 feet. Life-zone, Lower Sonoran " (Grinnell)

Heermanni Group

Northern California Kangaroo Rat.—*Dipodomys heermanni californicus* (Merriam).

Size medium; face broad; toes usually four in number; tip of tail white; general coloration dark. Resembling *agilis* in coloration, but slightly darker. Total length, 12.5 inches; tail vertebræ, 7.8 inches; hind foot, 1.8 inches. Found in "Northern California, chiefly east of the humid

coast belt and west of the Sacramento and Pit rivers, north from San Francisco Bay and the Strait of Carquinez to (and beyond) the Oregon line. Altitudinal range, 200 to 4,500 feet. Life-zone, Upper Sonoran and, locally, Transition." (Grinnell)

Lesser California Kangaroo Rat.—*Dipodomys heermanni eximius* (Grinnell).

Resembling *californicus* but smaller and with less brightly cinnamon-buff coloration; upperparts pinkish buff. Total length, 11.5 inches; tail vertebræ, 7 inches; hind foot, 1.66 inches. Found in "The eastern side of the lower Sacramento Valley, including the Marysville Buttes, from the vicinity of Red Bluff, Tehama County, southeast to Limekiln, Eldorado County. Altitudinal range, 200 to 1200 feet. Life-zone, Upper and Lower Sonoran." (Grinnell)

Heermann Kangaroo Rat.—*Dipodomys heermanni heermanni* Le Conte.

Closely resembling *californicus* except for presence of five toes instead of four, and the usual absence of white tip to tail. Total length, 11.7 inches; tail vertebræ, 7.2 inches; hind foot, 1.7 inches. Found on "West base of central Sierra Nevada, at least from Carbondale, Amador County, south to Coulterville, Mariposa County. Altitudinal range, 500 to 3200 feet. Life-zone, Upper Sonoran (lower edge of Transition locally)." (Grinnell)

Tulare Kangaroo Rat.—*Dipodomys heermanni tularensis* (Merriam).

Paler than *heermanni* which it resembles externally; upperparts warm buff. Total length, 11.8 inches; tail vertebræ, 7 inches; hind foot, 1.66 inches. Found on "the floor of the San Joaquin Valley. Extends to the northward not farther on the eastern side than the vicinity of Raymond, Madera County, but on the western side to near Tracy; south-eastward to vicinity of Bakersfield and Buena Vista Lake. Altitudinal range, 120 to 3000 feet. Life-zone mostly Lower Sonoran, but reaching into Upper Sonoran along the Tumbler Mountains, west of McKittrick, and on the lower western slopes of the Sierra Nevada." (Grinnell)

Merced Kangaroo Rat.—*Dipodomys heermanni dixonii* (Grinnell).

Intermediate in color between *tularensis* and *heermanni*; smaller than either; tip of tail dusky; five toes present. Total length, 11.3 inches; tail vertebræ, 6.8 inches; hind foot, 1.65 inches. Found on "Floor of lower (northern end) San Joaquin Valley, on the eastern side of the San Joaquin River, in Stanislaus and Merced Counties. Altitudinal range, below 500 feet. Life-zone Lower Sonoran." (Grinnell).

Berkeley Kangaroo Rat.—*Dipodomys heermanni berkeleyensis* (Grinnell).

Resembling *tularensis* but darker; tip of tail dusky. Total

length, 12 inches; tail vertebræ, 7.2 inches; hind foot, 1.64 inches. Found on "Presumably the Mount Diablo range and adjacent hills to the east of San Francisco Bay. Life-zone, Upper Sonoran. Only the one locality, Berkeley, represented in the material actually handled. This material comprises but 4 specimens." (Grinnell)

Salinas Kangaroo Rat.—*Dipodomys heermanni goldmani* (Merriam).

Resembling *berkeleyensis* but ears slightly larger and tail less tufted. Total length, 11.6 inches; tail vertebræ, 7.1 inches; hind foot, 1.7 inches. Found in "The lower (northern) end of the Salinas Valley and adjacent smaller valleys and bare hillsides, from the seacoast on Monterey Bay just south of the mouth of the Salinas River southeast to vicinity of Soledad; east to Bear Valley, in vicinity of Cook P. O., in San Benito County, and thence north to San José, in Santa Clara County. Altitudinal range, sea-level up to about 1300 feet. Life-zone, Upper Sonoran." (Grinnell)

Jolon Kangaroo Rat.—*Dipodomys heermanni jolonensis* (Grinnell).

Larger than *goldmani*; tail more tufted; paler on dorsal region; resembling *tularensis* in color. Total length, 12.2 inches; tail vertebræ, 7.5 inches; hind foot, 1.75 inches. Found in "The upper (southern) end of the Salinas Valley and tributary valleys, from vicinity of King City and Peachtree, in Monterey County, south at least to Creston, in San Luis Obispo County; west to Jolon. Altitudinal range, 400 to 1500 feet. Life-zone, chiefly Lower Sonoran." (Grinnell).

Carrizo Plain Kangaroo Rat.—*Dipodomys heermanni swarthi* (Grinnell).

Paler than *jolonensis* and with reduced dark markings. Total length, 11.9 inches; tail vertebræ, 7 inches; hind foot, 1.74 inches. Found in "The extreme southwestern border of the San Joaquin Valley, in vicinity of McKittrick and San Emigdio, and also the Carrizo and Cuyama plains; the stations of occurrence lie in extreme southwestern Kern County, southeastern San Luis Obispo County, and northern Santa Barbara County. Altitudinal range, 300 to 2000 feet. Life-zone, Lower Sonoran." (Grinnell)

Morro Bay Kangaroo Rat.—*Dipodomys morroensis* (Merriam). Darkest of the Kangaroo Rats. Upperparts tawny olive washed with blackish; white hip-stripe incomplete or absent; tail weakly tufted, lateral white tail stripes very narrow. Total length, 11.8 inches; tail vertebræ, 7 inches; hind foot, 1.7 inches. Found in "Sandy ground in the immediate vicinity of Morro Bay, San Luis Obispo County. Area of known habitat less than four miles square. Altitudinal range, sea-level up to 250 feet. Life zone, Upper Sonoran." (Grinnell)

Mohave Kangaroo Rat.—*Dipodomys mohavensis* (Grinnell).

Size rather large; color pale; five toes present. Upperparts ochraceous buff. Total length, 11.6 inches; tail vertebrae, 6.7 inches; hind foot, 1.75 inches. Found in "The Mohave Desert region, north into the lower end of Owens Valley as far as the vicinity of Lone Pine, south into Antelope Valley, in extreme northern Los Angeles County, and to Hesperia, San Bernardino County, east through the Providence and New York mountains, and west over the Walker and Kelso passes into the Kern River basin as far as Isabella, Kern County. Altitudinal range, 2500 to 5500 feet. Life-zone, Lower Sonoran, in its upper portion." (Grinnell)

Pale-faced Kangaroo Rat.—*Dipodomys leucogenys* (Grinnell).

Larger and darker colored than *mohavensis*; tail more heavily haired; light cheek areas pale grayish white. Total length, 12 inches; tail vertebrae, 7 inches; hind foot, 1.8 inches. Found in "The territory lying southeast of Mono Lake and in the head of Owens Valley, thence southward, along the west side of Owens Valley, as far as the vicinity of Independence. Altitudinal range, 3900 to 7300 feet. Life-zone, Upper Sonoran and, at least at the north, Transition." (Grinnell)

Panamint Kangaroo Rat.—*Dipodomys panamintinus* (Merriam).

Size rather large; five toes normally present; general coloration dark, slightly paler than in *agilis*. Total length, 12 inches; tail vertebrae, 7 inches; hind foot, 1.8 inches. Found in "The highest parts of the northern section of the Panamint Mountains, in the vicinity of Jackass Spring. Area of known habitat about 6 by 8 miles. Altitudinal range, 6000 to 7000 feet. Life-zone, Upper Sonoran and lower edge of Transition." (Grinnell)

Stephens Kangaroo Rat.—*Dipodomys stephensi* (Merriam).

Size medium; five toes present; ear small; color as in *agilis*. Total length, 11.6 inches; tail vertebrae, 6.9 inches; hind foot, 1.68 inches. Found in "San Jacinto Valley and vicinity, western Riverside County and extreme southern San Bernardino County. Altitudinal range, 1100-1600 feet. Life-zone, Lower Sonoran." (Grinnell)

Giant Kangaroo Rat.—*Dipodomys ingens* (Merriam).

Size very large; five toes present; face broad; tail relatively short; ear proportionally small; coloration as in *tularensis*. Total length, 13.2 inches; tail vertebrae, 7.4 inches; hind foot, 2.0 inches. Found in "A narrow strip of semiarid, more or less level territory along the southwestern border of the San Joaquin Valley, including also the nearby Carrizo Plain and Cuyama Valley. Recorded north to mouth of Panoche Creek, in western Fresno County, and south to Cuyama Valley, in southern San Luis Obispo County and extreme northern Santa Barbara County. Altitudinal range, 500-2500 feet. Life-zone, Lower Sonoran." (Grinnell)

Spectabilis Group

Large Kangaroo Rat.—*Dipodomys spectabilis spectabilis* Merriam. Plate XXVI.

Size very large; tail very long, tipped with white; coloration rich; toes four in number. Upperparts ochraceous buff, sprinkled with black; sides brighter than back. Total length, 14 inches; tail vertebræ, 8.5 inches; hind foot, 2.1 inches. Found in western Texas east to eastern edge of the Pecos Valley, north into Arizona and New Mexico.

Bailey Kangaroo Rat.—*Dipodomys spectabilis baileyi* Goldman. Larger than typical *spectabilis*, color slightly paler. Upperparts pinkish buff, sprinkled with black, brightest and clearest on sides; tail pure black all around near tip, tip white. Total length, 15.2 inches; tail vertebræ, 11.2 inches; hind foot, 2.3 inches. Found from northwestern New Mexico to western Texas.

Phillipsii Group

Loring Kangaroo Rat.—*Dipodomys elator* Merriam.

Size medium; toes four in number; ears small; black facial markings well defined. Upperparts clay color, sprinkled with dark-tipped hairs. Total length, 11.6 inches; tail vertebræ, 6.8 inches; hind foot, 1.8 inches. Found in northern Texas.

Merriami Group

Merriam Kangaroo Rat.—*Dipodomys merriami merriami* Mearns.

Size small; four toes present; tail with dusky tuft, dorsal and ventral stripes present; plantar stripe present but pale. Upperparts light ochraceous buff, sprinkled with dusky in mid-dorsal region. Total length, 9.9 inches; tail vertebræ, 5.8 inches; hind foot, 1.54 inches. Found in "the Mohave Desert region. Ranges north in Inyo County through Death Valley, and through Owens Valley as far as Independence; west, in Kern County, over the pass at the head of Kelso Creek and down into the valley of the South Fork of the Kern River as far as Weldon; south, along the Colorado River, as far as Blythe; east into Nevada and across the Colorado River into Arizona. Altitudinal range,—200 to 7000 feet. Life-zone, Lower Sonoran." (Grinnell)

El Paso Kangaroo Rat.—*Dipodomys merriami ambiguus* (Merriam).

Resembling typical *merriami*, but ears smaller, tail shorter, and hind feet larger. Upperparts buffy drab, mixed with black-tipped hairs, darkest on rump, brightest on sides. Total length, 9.3 inches; tail vertebræ, 5.3 inches; hind foot, 1.3 inches. Found in the vicinity of El Paso, Texas.

San Bernardino Kangaroo Rat.—*Dipodomys merriami parvus* (Rhoads).

Slightly smaller than typical *merriami*; coloration grayer; pelage less silky; black markings on face and tail better developed. Total length, 9.3 inches; tail vertebræ, 5.4 inches; hind foot, 1.44 inches. Found in "The San Bernardino and San Jacinto valleys, on the Pacific slope of southern California in San Bernardino and Riverside counties. Northernmost station, Cajon Wash; southernmost, Valle Vista. Altitudinal range, 1000 to 1800 feet. Life-zone, Lower Sonoran." (Grinnell)

Allied Kangaroo Rat.—*Dipodomys merriami simiolus* (Rhoads).

Closely resembling typical *merriami*, but slightly smaller and paler. Total length, 9.6 inches; tail vertebræ, 5.8 inches; hind foot, 1.5 inches. Found in "the Colorado Desert. Ranges northwest as far as Cabezon, in San Geronimo Pass; west as far as La Puerta and Vallecito, in eastern San Diego County; north, along the Colorado River nearly to the vicinity of Palo Verde; east to the Colorado River, and beyond in the vicinity of Yuma; south across the Mexican line. Altitudinal range, 180 to 3500 feet. Life-zone, Lower Sonoran." (Grinnell)

Tipton Kangaroo Rat.—*Dipodomys nitratooides nitratooides* (Merriam). Plate XXVI.

Smaller than typical *merriami*; pelage coarser; less ochraceous on dorsal area; dark facial markings blacker; dark tail stripes broader and blacker. Total length, 9.3 inches; tail vertebræ, 5.6 inches; hind foot, 1.4 inches. Found on "The floor of the southeastern (upper) side and end of the San Joaquin Valley, from Tipton, Tulare County, south to Caliente Wash, Kern County, and west to north side of Buena Vista Lake. Altitudinal range, 250 to 600 feet. Life-zone, Lower Sonoran." (Grinnell)

Fresno Kangaroo Rat.—*Dipodomys nitratooides exilis* (Merriam).

Smaller than typical *nitratooides* but similar to it in general characters; darker in color; upperparts snuff-brown; more dusky on face. Total length, 8.6 inches; tail vertebræ, 5.1 inches; hind foot, 1.32 inches. Found in "So far as now known, only a small portion of the east side of the San Joaquin Valley north of Tulare Lake, in the immediate vicinity of Fresno. Altitude of Fresno district, about 300 feet. Life-zone, Lower Sonoran." (Grinnell)

Short-nosed Kangaroo Rat.—*Dipodomys nitratooides brevinasus* (Grinnell).

Slightly paler and more ochraceous than typical *nitratooides*. Total length, 9.5 inches; tail vertebræ, 5.4 inches; hind foot, 1.4 inches. Found on "The floor of the west side of the San Joaquin Valley, from near the mouth of Panoche Creek, in western Fresno County, south to near mouth of

San Emigdio Creek, in southwestern Kern County. Altitudinal range, 175 to 600 feet. Life-zone, Lower Sonoran." (Grinnell)

Ordii Group

Ord Kangaroo Rat.—*Dipodomys ordii ordii* Woodhouse.

Size medium; five toes present; tail medium; upperparts deep ochraceous buff, sprinkled lightly with black; black markings not very extensive. Total length, 9.6 inches; tail vertebræ, 5.4 inches; hind foot, 1.5 inches. Found from Texas north through Arizona and New Mexico.

Columbian Kangaroo Rat.—*Dipodomys ordii columbianus* (Merriam). Plate XXVI.

Size small; five toes present; face broad; ears blackish; blackish facial markings present; general coloration cinnamon-buff; tail relatively short; plantar stripe gray; conspicuous white spot over eye and at posterior base of ear. Total length, 9.3 inches; tail vertebræ, 5.2 inches; hind foot, 1.5 inches. Found in "the northern portion of the Great Basin area of the western United States, and might be expected to occur generally over the lower sagebrush levels in the elevated northeastern corner of California. . . . Life-zone, Upper Sonoran." (Grinnell)

Mono Kangaroo Rat.—*Dipodomys ordii monoensis* (Grinnell).

Resembling *columbianus* but paler; dark markings restricted, white extensive; lateral white tail stripes as broad as dorsal dark stripe. Upperparts pinkish buff. Total length, 9.3 inches; tail vertebræ, 5 inches; hind foot, 1.35 inches. Found in "The sagebrush flats at the extreme head of Owens Valley. Altitudinal range, 5300-5640 feet. Life-zone, Upper Sonoran." (Grinnell)

Utah Kangaroo Rat.—*Dipodomys ordii utahensis* (Merriam).

Resembling *montanus* but hind foot smaller and coloration more drab. Upperparts near clay color. Total length, 10.4 inches; tail vertebræ, 5.9 inches; hind foot, 1.6 inches. Found in Weber County, Utah.

Chapman Kangaroo Rat.—*Dipodomys ordii chapmani* (Mearns).

Upperparts cinnamon-buff; sides clearer and brighter; plantar stripe well developed. Total length, 10.2 inches; tail vertebræ, 5.5 inches; hind foot, 1.44 inches. Found in Yavapai County, Arizona.

Mountain Kangaroo Rat.—*Dipodomys ordii montanus* (Baird).

Upperparts dull buffy ochraceous, sprinkled with black; large white spot back of ear; dark tail stripes blackish. Total length, 9.8 inches; tail vertebræ, 5.5 inches; hind foot, 1.6 inches. Found in Costilla County, Colorado.

Painted Desert Kangaroo Rat.—*Dipodomys ordii longipes* (Merriam).

Upperparts bright ochraceous buff, finely sprinkled with black. Total length, 10.8 inches; tail vertebræ, 6.5 inches;

hind foot, 1.65 inches. Found on the Painted Desert, Coconino County, Arizona, and adjacent portions of New Mexico, southeastern Utah, and southwestern Colorado.

Wyoming Kangaroo Rat.—*Dipodomys ordii luteolus* (Goldman).

Size large (for the group); color pallid; tail long. Upperparts light buff to light ochraceous buff. Total length, 10.5 inches; tail vertebræ, 6 inches; hind foot, 1.65 inches. Found in "Wyoming, southeastern Montana, and the upper part of the Green River Valley in northwestern Colorado." (Goldman)

Richardson Kangaroo Rat.—*Dipodomys ordii richardsoni* (Allen).

Paler colored than *montanus*, smaller than *luteolus*; upperparts pale buffy ochraceous, sprinkled with black. Total length, 10.4 inches; tail vertebræ, 5.8 inches; hind foot, 1.6 inches. Found in Oklahoma, western Texas, eastern New Mexico, Colorado, northeastern Utah and Wyoming.

Compactus Group

Padre Island Kangaroo Rat.—*Dipodomys compactus* True.

Size small, color pale, dark markings nearly obsolete. Upperparts pale buffy gray; sides clearer in tone; no conspicuous dark markings. Total length, 8 inches; tail vertebræ, 4 inches; hind foot, 1.24 inches. Found on Padre Island, Cameron County, Texas.

Sennett Kangaroo Rat.—*Dipodomys sennetti* (Allen).

Slightly larger than *compactus* and darker; no conspicuous black markings. Upperparts cinnamon-buff, sides clearer in tone. Total length, 10.45 inches; tail vertebræ, 6.25 inches; hind foot, 1.4 inches. Found in southern Texas, north of Brownsville.

* * * * *

Pocket Rats should not be confused with any other rodents for they are unique in the possession of the following combination of characters; large mouse or small rat size; external, fur-lined cheek-pouches; robust body; long, tufted tail; elongated hind legs and weak forelegs; long silky pelage; and beautiful color pattern. They are undoubtedly the handsomest of North American rodents and are far removed from the mental picture brought to the mind of the average person by the word Rat. Irreproachable habits, gentle disposition and a cleanly mode of life make fascinating pets of these dainty mammals.

Pocket Rats are found in very much the same environment as Pocket Mice,—prairies, arid plains, and deserts. The greatest number of species and individuals is to be encountered

in the dry Southwest. Most of the species prefer sandy tracts or regions where dry, loose soil prevails, although some frequent localities of hard, gravelly soil. None live in heavily timbered districts. They burrow extensively and spend the daytime underground. The large eye of the Pocket Rat is one of the characters which favors a nocturnal activity.

The burrows are large, cleanly cut and often placed with no attempt at concealment. The earth immediately about the burrow entrances may be so undermined by subterranean passages and chambers that one breaks through upon approach, and generally an abundance of tiny tracks radiate out from the holes or collect into two or three main paths and lead away to nearby sources of food or to neighboring burrows. Frequently the mark of the long tail is seen in the sand.

Where the sand has drifted into low dunes or there are slight eminences, these Rats make their homes at the base of such a rise and run the holes in horizontally. Clumps of brush serve to hold the sand and create little islands of stationary material and these are favorite spots for burrows. During the day the entrances may be blocked up from within.

Pocket Rats seem to be social by nature and the signs usually indicate the presence of several individuals about each series of burrows.

The cheek-pouches are used as food containers and in them the rodents carry the seeds which they take into the burrows to be stored up or eaten. The animals do not hibernate. They get along very well without water, in spite of the fact that their food is very dry, since they seldom or never eat green vegetation. A Pocket Rat that I had as a pet lived for several months on dry wheat and paid no attention to water, which was removed from the cage after the first few days.

The kangaroo-like hind legs are used as one might imagine and the animals progress in leaps in which the forelegs take no part. These leaps may be of only a few inches or up to six feet or more. My pet used the forefeet only to hold food and hopped about on the hind feet entirely. He was exceedingly quick and left the floor as if released by a spring. He was very particular about his long tail and, if in handling him his tail was grasped, became very indignant. Every time he washed himself the operation closed with passing his tail rapidly between his forepaws and lips. He seemed to inspect

it carefully for any injury and I suspect that the tail is very important in the balance and locomotion of the Kangaroo Rats.

Over most of the range of this genus probably two or more families are reared a season. Young may be encountered in almost every month of the year wherever winter is not severe, and the number in a litter varies from three to five.

Genus *Microdipodops*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

Dwarf Pocket Rat.—*Microdipodops megacephalus* and related forms

Names.—Dwarf Pocket Rat; Pigmy Pocket Rat; Kangaroo Mouse.

General Description.—In general appearance like a large, heavy-bodied Pocket Mouse (*Perognathus*); head large; hind feet long; tail more than half total length; temporal region of skull greatly inflated; hind feet with five toes, soles densely haired; habit nocturnal.

Color.—Sexes colored alike; seasonal variation slight.

Upperparts.—Yellowish brown finely mixed with black-tipped hairs and slightly tinged with olive; pale ochraceous wash on sides; tail above like back except for blackish on terminal third; blackish crescent at base of whiskers; buffy spot back of each ear.

Underparts.—White with wash of pale ochraceous on belly.

Measurements.—Sexes of equal size. Total length, 6 inches; tail vertebræ, 3.2 inches; hind foot, 1 inch.

Geographical Distribution.—Arid section of Great Basin district where states of Oregon, Nevada, and California meet, south as far as Mono County, Calif., east to Elko County, Nev.

Food.—Seeds and grains.

Enemies.—Snakes, Owls, Foxes, Skunks, Coyotes, Weasels, etc.

Species and Subspecies of the Genus *Microdipodops*

Nevada Dwarf Pocket Rat.—*Microdipodops megacephalus megacephalus* Merriam.

As described. Found in Elko County, Nevada.

Oregon Dwarf Pocket Rat.—*Microdipodops megacephalus oregonus* Merriam.

Resembling typical *megacephalus*, but "tail longer; pelage less fluffy, upperparts more olivaceous and less conspicuously lined with black-tipped hairs; underparts white—buffy wash less marked; a whitish streak usually present along underside of tail; skull smaller." (Merriam) Total length, 6 inches; tail vertebræ, 3.5 inches; hind foot, 1 inch. Found in the Alvord Desert region, Harney County, Oregon, and Modoc County, California.

Pale Dwarf Pocket Rat.—*Microdipodops pallidus* Merriam.

"Slightly larger than *megacephalus*; pelage long, soft, lax and fluffy; tail decidedly longer and without dark tip; body much paler. Color.—Upperparts pale buffy fulvous, finely and inconspicuously lined with dark-tipped hairs; underparts, including sides of nose, lower sides of face, legs, feet, and underside of tail white; upperside of tail buffy throughout without dark tip." (Merriam) Total length, 6.8 inches; tail vertebræ, 4 inches; hind foot, 1 inch. Found in the region of the Sink of the Humboldt and Carson, Churchill County, Nevada.

California Dwarf Pocket Rat.—*Microdipodops californicus* Merriam.

Equal to *megacephalus* in size but with longer tail and hind foot, more compact pelage and snow white head markings and underparts. Upperparts olivaceous finely sprinkled with black; sides of nose, spot over eye, patch back of ear clear white; tail above buffy with blackish near tip, below white; underparts clear white. Total length, 6.4 inches; tail vertebræ, 3.6 inches; hind foot, 1 inch. Found in Sierra Valley, Plumas County, California.

Mono Dwarf Pocket Rat.—*Microdipodops polionotus* Grinnell.

Most like *pallidus* but even paler in color; pelage shorter and less fluffy, smaller and with shorter tail. Upperparts cartridge-buff with faint sprinkling of black-tipped hairs, especially on rump; ashy on sides of face and rump; conspicuous white spot at base of and behind each ear; underparts clear white in marked contrast to color of sides. Total length, 6 inches; tail vertebræ, 3.3 inches; hind foot, .96 inch. Found in Mono County, California (near Benton Station, alt. 5200 feet).

* * * * *

Dwarf Pocket Rats are apparently rare and local in distribution. There are comparatively few in museum collections and not much has been written about habits. They live in a very restricted section where they seem to prefer arid and desert conditions. These Rats have been found on sandy, sagebrush flats.

Joseph Mailliard, in a note in the *Journal of Mammalogy*, February, 1925, writes:

"This little village (Eagleville) lies at the eastern base of the Warner Mountains, on the edge of a long strip of meadow land that is irrigated from the mountain streams. East of this narrow meadow is Middle Lake, which, except for a small laguna at its southern extremity, is a lake only in winter and spring. The rest of the year it is but a bare expanse of alkali sand. East again of the lake is a desert of sand, lava and sagebrush that stretches across the close-by state line far into Nevada.

"In this desert, at a point about two miles east of Eagleville, it was my good fortune to encounter colonies of both the Columbian kangaroo rat, *Dipodomys ordii columbianus* (Merriam), and the Oregon kangaroo mouse, *Microdipodops megacephalus oregonus* Merriam. These colonies, which appeared to be small ones, were found scattered among the low, brush-grown sand dunes and hummocks that cover that part of the desert. In walking over the dunes my foot frequently broke through the surface into the burrows, many of which appeared to be unoccupied.

"The main reason for supposing that the colonies were limited in the number of their respective members was that it seldom was found profitable to trap in a colony for more than one night before moving the traps to another sand dune. Some mornings, however, even when the trap lines had been laid out on absolutely fresh ground, there were rodent tracks all around and often close up to many of the traps, without a single one of them having been sprung or a particle of the bait—consisting generally of rolled oats—having been touched, but in such cases no change was made in the location of the trap line and usually a comparatively fair catch was made the following night."

Family Castoridæ. Beavers

Resembling the Sciuridæ but cheek-teeth not rooted, crown pattern with re-entrant enamel folds instead of tubercles; mandible heavy; size large; form thickset; tail broad, flat, and scaly; habit aquatic.

Genus *Castor*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3}$ = 20.

Beaver.—*Castor canadensis*

and related forms

Names.—Beaver; American Beaver. Plate XXVII.

General Description.—Size very large, largest of North American rodents; form robust; tail broad, flat, scaly; ears short; five toes on fore and hind feet; hind feet webbed, with



Fig. 65. Beaver

claw of second toe double or cleft; anal glands present; pelage composed of long, hard hairs and soft short underfur; color brown; habit aquatic.

Color.—Sexes colored alike; no very great seasonal variation.

Upperparts rich dark brown, the long hairs chestnut-brown, the underfur without any reddish tinge; head brighter; incisors orange; underparts somewhat lighter in tone than upperparts and lacking the chestnut tinge.

Immature pelage.—Practically as in adults, perhaps a little lighter in general tone.

In worn or summer pelage the long hard hairs may be so scanty that the pelage seems to be made up of the duller and browner underfur.

Measurements.—No very great difference in size between sexes. Total length, 43 inches; tail vertebræ, 16 inches long by 4.5 inches broad; hind foot, 7 inches; weight, 30 pounds to maximum of 68 pounds.

Geographical Distribution.—Most of North America from Alaska and Labrador to the Rio Grande.

Food.—Bark, twigs, even wood, of deciduous trees, especially aspen, cottonwoods and willows; also other vegetable matter such as roots of aquatic plants, grass, etc.

Enemies.—Bear, Wolf, Fisher, Otter, Lynx and Wolverine.

Species and Subspecies of the Genus *Castor*

Canadian Beaver.—*Castor canadensis canadensis* Kuhl.

As described above. Found in northern North America from nearly 70° north in Yukon and 58° in Labrador, south



FIG. 66. Forefoot of Beaver

to about 35° in eastern and central states, and 45° in the Rocky Mountain section.

Vancouver Island Beaver.—*Castor canadensis leucodonta* Gray.

Resembling typical *canadensis* but larger, and general coloration of pelage paler. Upperparts cinnamon-buff. Total length, 46 inches; tail vertebræ, 18 inches; hind foot, 8 inches. Found on Vancouver Island, British Columbia.

Pacific Beaver.—*Castor canadensis pacificus* Rhoads.

Largest of the Beavers; slightly paler than *leucodonta*. Upperparts dark, glossy, reddish chestnut; underparts seal-brown. Total length, 46 inches; tail vertebræ, 14 inches; hind foot, 7.4 inches; scaly portion of tail 11.8 by 5 inches. Found on the Pacific slope from southern Oregon to Alaska.

Admiralty Beaver.—*Castor canadensis phæus* Heller.

Darker than *leucodonta* to which it is most closely related. Upperparts dark seal-brown, the long hairs almost black,

lighter on head and shoulders; rump and base of tail dark Vandyke brown; ears black. Total length, 41 inches; tail vertebræ, 18 inches; hind foot, 7 inches; scaly portion of tail 10 by 5 inches. Found on Admiralty Island, Alaska.

Cook Inlet Beaver.—*Castor canadensis belugæ* Taylor.

Intermediate between typical *canadensis* and *leucodonta*, paler than the latter. Upperparts cinnamon to ochraceous tawny. Found in the Cook Inlet region of Alaska, south to Stuart Lake, British Columbia.

Carolina Beaver.—*Castor canadensis carolinensis* Rhoads.

Larger than typical *canadensis*, with relatively broader tail. Upperparts bright hazel brightening to cinnamon-rufous on rump. Total length, 45 inches; scaly portion of tail, 11

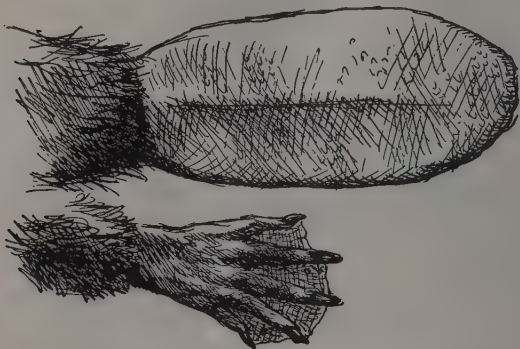


FIG. 67. Tail and hind foot of Beaver

by 6.3 inches; hind foot, 7.4 inches. Found in North Carolina, south to northern Florida and the Gulf of Mexico, west to eastern Texas.

Broad-tailed Beaver; Sonora Beaver.—*Castor canadensis frondator* Mearns.

Larger, paler, and tail broader than in typical *canadensis*; paler than *carolinensis*. Upperparts russet, sides wood-brown; feet burnt sienna. Total length, 45 inches; tail vertebræ, 15 inches; scaly portion of tail, 11.4 by 6.2 inches; weight, 62 pounds. Found in the southwestern states from Mexico north to Wyoming and Montana, not known west of about the 115th meridian.

Rio Grande Beaver.—*Castor canadensis mexicanus* Bailey.

"Size medium, colors dull and pale with very little chestnut at any season . . . Upperparts dull russet, brightest on crown, palest on cheeks and rump." (Bailey) Total length, 43

inches; tail vertebræ, 16 inches; hind foot, 7 inches. Found on the Rio Grande drainage of New Mexico and Texas.

Woods Beaver.—*Castor canadensis michiganensis* Bailey.

Size rather large, "colors very dark, ears and feet black; . . . Color . . . in early winter pelage: upperparts dark umber brown, brighter, almost mahogany brown on head and cheeks." (Bailey) Total length, 47 inches; tail vertebræ, 19 inches; hind foot, 7.4 inches; weight, 58 pounds. Found in Upper Peninsula region of Michigan.

Missouri River Beaver.—*Castor canadensis missouriensis* Bailey.

Somewhat smaller than typical *canadensis*; paler and duller brown. Upperparts bright hazel brown; underparts smoky gray. The type specimen, not full grown, measured, total length, 36 inches; tail vertebræ, 11 inches; hind foot, 6.8 inches. Found on the Missouri River drainage from Nebraska north and west to Montana.

Texas Beaver.—*Castor canadensis texensis* Bailey.

Large and pale, most like *frondator*. Found in the region drained by the Rio Colorado, eastern Texas.

Golden Beaver.—*Castor subauratus subauratus* Taylor.

A large Beaver similar in color to *frondator*, but darker. Upperparts hazel to clay color; underparts sepia. Total length, 47 inches; scaly portion of tail, 13 inches long; hind foot, 7.8 inches. Found on the drainage of the Tuolumne and San Joaquin Rivers, California.

Shasta Beaver.—*Castor subauratus shastensis* Taylor.

Known only from skulls; in cranial characters nearest to typical *subauratus*. Found in Shasta County, California, on the eastern slope of the main chain of the Sierra Nevada.

Newfoundland Beaver.—*Castor cæcator* Bangs.

Resembling typical *canadensis* but smaller and with marked cranial differences. No external characters given by the describer. Found in Newfoundland.

* * * * *

Although the Beaver is scarce today compared to its abundance when North America was first settled, it has played such an important part in the history of our country and has been mentioned so often in literature that to most people it is a familiar animal. Fortunately the conservationists are working for the rehabilitation of this big rodent and in a few places the Beaver is building up its numbers to such an extent that it is becoming a common species again. A staple with the trapper and a standard of valuation in barter and exchange, the pelt of the Beaver has been sought for centuries and the demands of the fur trade all but exterminated the animal.

Industries have depended upon the Beaver for their exist-

ence. To get Beaver fur the trappers and fur companies, like the Hudson Bay Company, pushed across the continent and laid the foundation for a later occupation in force by settlers. Other fur-bearers contributed to this motive, but the Beaver made up the bulk of the traffic. For years the hat makers would use only Beaver fur for felting material of fine hats.

In literature, the Beaver has been held up as the mirror of sagacity, engineering skill, and general all-around industry. Whole volumes have been devoted to him alone. As is to be expected, not all that has been written of the Beaver is so. Several of the best works are cited in the bibliography in the back of this field book, and the reader is referred to them for the many interesting details of the Beaver's home life. Plate XXVIII.

The Beaver is not peculiar to the New World but has an extensive distribution throughout most of the Northern Hemisphere. It has become extinct, however, over much of its Old World range. The large size, flat, scaly tail, and aquatic habit serve as unmistakable characters of identification.

The number of young at a birth varies from two to six, or rarely eight. The average number seems to be four, and the young are born in April to May, occasionally late in March. The young stay with the parents for a year and the known facts indicate that Beavers are monogamous and remain mated for life.

Beaver may be active any hour of the twenty-four, but are most active from sunset to sunrise, especially in a region where they are apt to be molested by enemies.

Family **Cricetidæ**. Native Rats and Mice

Form typically rat or mouse-like; molar teeth never more than three on a side; molar crown pattern composed of tubercles arranged in two primary longitudinal rows, or made up of angular figures.

Subfamily **Cricetinaë**

Molars rooted and with tubercles arranged in two primary longitudinal rows.

Genus *Onychomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Grasshopper Mouse.—*Onychomys leucogaster*
and related forms.

Names.—Grasshopper Mouse; Scorpion Mouse. Plate XXX.

General Description.—A rather sturdily-built Mouse, with comparatively short tail which is thick and tapering; forefeet fairly large, with five tubercles; hind feet with four tubercles



FIG. 68. Grasshopper Mouse

and densely furred on sole from heel to tubercles; pelage usually soft, full and silky; color pattern sharply bicolor, white below and colored above; nocturnal in habit.

Color.—Sexes colored alike.

Upperparts.—Dark drab brown sprinkled with dark brown hairs, darkest along dorsal region and top of head; nose grayish; pure white tufts, rather woolly in character, at bases of ears; ears dark brown on front, whitish behind, lined inside with white hairs; tail above drab brown for basal two-thirds, below whitish, terminal third whitish above and below.

Underparts.—Clear white in marked contrast to upperparts, white reaching up on lower sides and cheeks, and extending down on feet; pelage of upperparts blackish slate at base, pelage of underparts white at base on chin, throat, and forelegs, blackish slate basally on middle chest and abdomen.

¹ For a full revision of this genus see N. Hollister, Proceedings U. S. National Museum, Vol. 47, pp. 427-489, 1914.

Sometimes occurring as a melanistic phase, glossy brownish black above and only slightly lighter below, some of the white retained as blotches.

Immature pelage.—Above dark blackish brown, without whitish ear tufts but with conspicuous black markings on front of ear; below white.

Measurements.—Total length, 6.5 inches; tail vertebræ, 1.7 inches; hind foot, .88 inch; ear from notch (dry specimen), .56 inch.

Geographical Distribution.—Western North America.

Food.—Chiefly insects, such as grasshoppers, crickets, scorpions, beetles, larvæ, etc., occasionally other Mice; vegetation and seeds.

Enemies.—Owls, Weasels, Foxes, Coyotes, Wildcats, and other small carnivores, Snakes.

Species and Subspecies of the Genus *Onychomys*

Leucogaster Group

Maximilian Grasshopper Mouse.—*Onychomys leucogaster leucogaster* (Wied).

As described above. Found in "Southern Manitoba, eastern North Dakota, northeastern South Dakota, and parts of extreme western Minnesota, west to Minot and Fort Clark, North Dakota. Transition Zone." (Hollister)

Audubon Grasshopper Mouse.—*Onychomys leucogaster missouriensis* (Audubon and Bachman).

Slightly smaller and paler than typical *leucogaster*. Upperparts dark grayish brown to rich wood-brown, depending on season and state of wear; rest of pelage about as in typical *leucogaster*. Total length, 6 inches; tail vertebræ, 1.6 inches; hind foot, .8 inch. Found in "Southeastern Alberta, southern Saskatchewan, northern and eastern Montana, western North Dakota, and northeastern Wyoming. North to Calgary, Alberta, and Carlton, Saskatchewan; east to Glenullin, North Dakota; south up the Missouri River to Bozeman, Montana, and up the branches of the Powder and Little Missouri Rivers into northeastern Wyoming. Chiefly arid Transition." (Hollister)

Great Plains Grasshopper Mouse.—*Onychomys leucogaster arcticeps* (Rhoads).

Paler and with more buffy than *missouriensis*. Upperparts light wood-brown washed with pinkish cinnamon over posterior dorsal region; ear tufts white, but not in marked contrast to rest of pelage because of its light tone, forepart of ear brownish; tail white, with narrow median stripe above,

GRASSHOPPER MOUSE

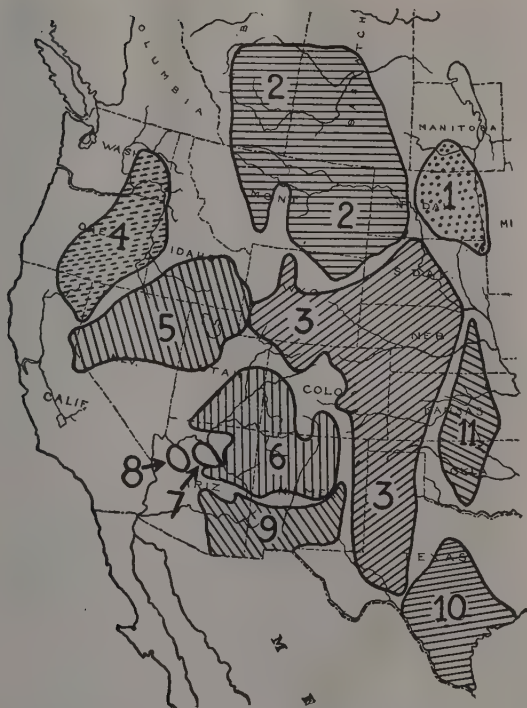


FIG. 69. Distribution of the subspecies of *Onychomys leucogaster*, north of Mexico, after Hollister

1. *Onychomys leucogaster leucogaster*
2. *Onychomys leucogaster missouriensis*
3. *Onychomys leucogaster arcticeps*
4. *Onychomys leucogaster fuscogriseus*
5. *Onychomys leucogaster brevicaudus*
6. *Onychomys leucogaster melanophrys*
7. *Onychomys leucogaster fuliginosus*
8. *Onychomys leucogaster capitulatus*
9. *Onychomys leucogaster ruidosa*
10. *Onychomys leucogaster longipes*
11. *Onychomys leucogaster breviauritus*

brownish for basal two-thirds; underparts clear white. Total length, 6 inches; tail vertebræ, 1.7 inches; hind foot, .85 inch. Found in "Upper Sonoran Great Plains from Wyoming and South Dakota to Texas. North to the Big Horn River in Wyoming and to the Cheyenne River in South Dakota; east to Bonesteel, South Dakota, and Trego County, Kansas; south to Fort Lancaster, Texas; and west to Bear River Divide in southwestern Wyoming, Golden and Salida, Colorado, and Santa Rosa, New Mexico." (Hollister)

Short-tailed Grasshopper Mouse.—*Onychomys leucogaster brevicaudus* Merriam.

Darker than *arcticeps*; smallest subspecies of *leucogaster*; tail short. Upperparts a light wood-brown, rich and glossy, darkened on face, head, and back; sides shading to cinnamon; ear tufts white basally, buffy at tips; ears dark brown anteriorly, white posteriorly; tail above, grayish brown, white-tipped, below, white; underparts pure white. Total length, 5.6 inches; tail vertebræ, 1.6 inches; hind foot, .76 inch. Found in "Southern Idaho, extreme southwestern Wyoming, northwestern Utah, and west across the northern half of Nevada into Lassen, Plumas, and Mono Counties, California." (Hollister)

Brown Grasshopper Mouse.—*Onychomys leucogaster fusco-griseus* Anthony.

Resembling *brevicaudus* but darker in color. Upperparts rich, glossy, reddish brown, dark in tone, darkest along dorsal region; sides browner; tail above, blackish brown, tipped with grayish white, below, white; underparts white. Immature pelages very dark, almost black. Total length, 5.7 inches; tail vertebræ, 1.5 inches; hind foot, .77 inch. Found in "Eastern Washington and Oregon, western Idaho, and northeastern California. South to Klamath Lake and the Madeline Plains." (Hollister)

Dark-browed Grasshopper Mouse.—*Onychomys leucogaster melanophrys* Merriam.

Darker and richer in color than *arcticeps*. Upperparts rich pinkish-cinnamon to cinnamon-buff, washed with brownish along dorsal region and top of head; eyebrows dark brown; ear tufts pale buffy; ears blackish, edged with white; tail above, pale brownish gray, tip and underside white; underparts clear white. Total length, 6.2 inches; tail vertebræ, 1.8 inches; hind foot .88 inch. Found in "South central and southeastern Utah, southwestern Colorado, north-eastern Arizona, and northwestern New Mexico. North in the Grand River Valley to Fruita, Colorado, and in the Rio Grande Valley to northern Costillo County, Colorado. West to Kanab, Utah, and Flagstaff, Arizona; east in New Mexico to Santa Fe and the Sandia Mountains; south to Acoma and the Zuni River." (Hollister)

Sooty Grasshopper Mouse.—*Onychomys leucogaster fuliginosus* (Merriam).

Resembling *melanophrys*, but pelage very dark. Upperparts dark blackish brown; sides lighter; ear tufts colored like head, not conspicuous; tail blackish brown above, white at tip and on underside; underparts white. Total length, 6.4 inches; tail vertebræ, 1.9 inches; hind foot, .86 inch. Found in "Lava beds and pinyon and cedar belt, east and northeast of San Francisco Mountain, Arizona." (Hollister)

New Mexico Grasshopper Mouse.—*Onychomys leucogaster ruidosæ* (Stone and Rehn).

Resembling *melanophrys* but darker and more richly colored. Upperparts rich, glossy wood-brown, washed with rich cinnamon and finely sprinkled with dark brown; sides lighter than back, almost pure cinnamon posteriorly; inconspicuous ear tufts pale cinnamon-brown; tail above, grayish brown, tip and underside whitish, underparts whitish. Total length, 6.2 inches; tail vertebræ, 2.0 inches; hind foot, .9 inch. Found chiefly in "the mountainous region of southeastern Arizona and central and southwestern New Mexico. North to Camp Verde, Arizona, and to the Manzano Mountains and Las Vegas, New Mexico; east to the Capitan Mountains; south into northern Chihuahua and Sonora." (Hollister)

Arizona Grasshopper Mouse.—*Onychomys leucogaster capitulatus* Hollister.

Resembling *ruidosæ* but smaller. Upperparts and rest of pelage essentially as in *ruidosæ*. Total length, 5.9 inches; tail vertebræ, 1.8 inches; hind foot, .88 inch. Found in lower end of Prospect Valley (Grand Canyon) and Aubrey Valley, Arizona.

Long-footed Grasshopper Mouse.—*Onychomys leucogaster longipes* (Merriam).

"Size large; colors dull; ears larger than in any other subspecies of *leucogaster*. . . . Upperparts drab, darkest on middle of back; finely lined with darker brownish, and with a wash of pale cinnamon over lower back and hips; an indistinct stripe of cinnamon along sides between color of upperparts and white of underparts, from fore legs to base of tail; a blackish spot each side of nose at base of whiskers; ear tufts scant, pale cinnamon color. Tail brown above with white tip; whitish below, not sharply bicolor. Underparts white, the hairs of throat and fore legs white to bases. There is little difference in the color of adults at any season." (Hollister) Total length, 6.6 inches; tail vertebræ, 2.2 inches; hind foot, .92 inch; ear from notch (dry skin), .64 inch. Found in "Central and southern Texas. . . . North to Tom Green and Concho Counties, Texas; west to the Pecos River; southeast to Rockport and Nueces Bay, Texas; south to Victoria, Tamaulipas. Lower Sonoran Zone." (Hollister)

Short-eared Grasshopper Mouse.—*Onychomys leucogaster brevicauritus* Hollister.

Resembling *longipes* but darker, tail shorter, hind foot smaller, and ear smaller. Upperparts (winter) rich blackish brown; sides lighter; hips and rump almost pure pinkish cinnamon; gray on nose, cinnamon spots at base of whiskers, cinnamon-buff ear tufts; grayish brown on upperside of tail, white on tip and underside; underparts white. Summer pelage grayish brown above, no conspicuous ear tufts. Total length, 6.2 inches; tail vertebræ, 1.7 inches; hind foot, .88 inch; ear from notch (dry skin), .52 inch. Found in "Eastern Nebraska, eastern and south-central Kansas, and middle Oklahoma. From Neligh, Nebraska, and Fort Riley and Neosha Falls, Kansas, west and south to Kinsley, Kansas, and to Woodward and Fort Reno, Oklahoma. Entirely within the Carolinian and Austroriparian faunas of the Austral region." (Hollister)

Torridus Group

Differentiated from the *leucogaster* group by smaller size, lighter build, and proportionally longer tail.

Coues Grasshopper Mouse.—*Onychomys torridus torridus* (Coues).

Medium in size, rich reddish brown in color. Upperparts from dark pinkish cinnamon, rich and glossy, to wood-brown with little red; darkest on back where it is washed with blackish brown; palest on nose and cheeks; conspicuous white ear tufts; ear dark brownish on outer side, edged with whitish; tail above, grayish brown, tip and underside white; underparts pure white; sharp contrast between under and upperparts. Ear tufts inconspicuous or wanting in summer and fall pelages. Total length, 5.8 inches; tail vertebræ, 2.1 inches; hind foot, .86 inch; ear from notch (dry skin), .56 inch. Found "from the Pecos Valley in Texas and southeastern New Mexico, west across southern New Mexico and Chihuahua into southeastern Arizona and northern Sonora. North in the Rio Grande Valley to Socorro, New Mexico; south to northern Durango." (Hollister)

Pallid Grasshopper Mouse.—*Onychomys torridus perpallidus* Mearns.

Slightly larger than typical *torridus* and paler in color; ears larger. Upperparts light pinkish cinnamon to vinaceous buff; finely sprinkled with dark hairs on back; ear tufts not differing much from color of head; pelage of upperparts slate-gray at base. "Tail, feet, and underparts as in *torridus*, but the underfur below very narrowly pale slate, very different from the broadly grayish-black underfur of *torridus*." (Hollister) Total length, 6.3 inches; tail vertebræ, 2.3 inches; hind foot, .88 inch; ear from notch (dry skin), .63 inch.

Found in "Colorado River Valley in western Arizona; eastward along tributary streams to Big Sandy Creek, Signal, and Phoenix. Doubtless occurs also in northwestern Sonora." (Hollister)

Desert Grasshopper Mouse.—*Onychomys torridus pulcher* (Elliot).

Smallest of the Grasshopper Mice; color very pale. Upperparts pale pinkish cinnamon with very little dark wash along back; ear tufts white, conspicuous (winter); rest of pelage essentially as in *perpallidus* except for slightly paler shades. Total length, 5.5 inches; tail vertebræ, 1.9 inches; hind foot, .78 inch. Found in "Mohave and Colorado Deserts, California, and Lower California, Mexico. Known by specimens from Granite Springs and Needles on the north to Seven Wells, Lower California, on the south; and from the Colorado River bottoms westward to Antelope Valley and through San Gorgonia Pass to Cabezon station." (Hollister)

Long-tailed Grasshopper Mouse.—*Onychomys torridus longicaudus* (Merriam).

Darker than *pulcher*; larger than *perpallidus*, with shorter tail, hind foot, and ear. Upperparts and rest of pelage essentially as in *perpallidus*. Total length, 5.6 inches; tail vertebræ, 2.0 inches; hind foot, .8 inch; ear from notch (dry skin), .52 inch. Found in "Southwestern Utah, northwestern Arizona north of the Colorado River, southern Nevada, and the adjacent desert mountain region of Inyo and Mono Counties, California. North in western Nevada to Carson Sink; west in California to Kearsarge Pass and to the Argus Mountains." (Hollister)

Owens Lake Grasshopper Mouse.—*Onychomys torridus clarus* Hollister.

Resembling *longicaudus*, but brighter colored. Upperparts from bright pinkish cinnamon to pinkish buff, very little sprinkling of darker hairs on back, pelage dark neutral gray basally; creamy white ear tufts not very conspicuous; tail whitish above and below except for narrow, indistinct median stripe of grayish brown for basal two-thirds above; underparts white. Total length, 5.6 inches; tail vertebræ, 2 inches; hind foot, .8 inch. Found in "Vicinity of Owens Lake, Coso Mountains, and Salt Wells Valley, Inyo County, California." (Hollister)

Tulare Grasshopper Mouse; San Joaquin Grasshopper Mouse.—*Onychomys torridus tularensis* Merriam.

Grayish drab in color. Upperparts from light drab with light wash of pinkish to grayish cinnamon, finely sprinkled with dark brown; grayish white ear tufts very inconspicuous; a faint, narrow lateral line of light pinkish buff; tail sharply bicolor, grayish brown above, tip, and underside white; underparts white; pelage above and below, except on chin and throat, gray at base. Total length, 5.8 inches; tail vertebræ, 2.1 inches; hind foot, .83 inch. Found in "Upper

San Joaquin Valley and neighboring foothills and valleys, California. North to Little Panoche Creek, San Benito County; south to Carriso Plain and Bakersfield." (Hollister)

Ramona Grasshopper Mouse.—*Onychomys torridus ramona* (Rhoads).

Darkest of the *torridus* group found in the United States. Upperparts from blackish brown (winter) to reddish brown (summer); sides reddish brown; ear tufts inconspicuous, brown and whitish; tail above, blackish brown, tip and underside whitish; underparts creamy white. Total length, 5.6 inches; tail vertebræ, 2.0 inches; hind foot, .8 inch. Found in "Extreme southwestern California and northwestern Lower California, Mexico. From San Fernando and San Bernardino south into Tecate Valley." (Hollister)

* * * * * * *

The Grasshopper Mice are soft-furred, attractive rodents and little apt to be confused with any other Mice. The white underparts serve to distinguish them from House Mice and most of the Voles, and the proportionally short, thick tail sets them off from the White-footed Mice.

Grasshopper Mice dwell on the plains and open stretches and are not found in forests. They have a preference for dry regions and reach their greatest abundance in the arid sections of the West or the deserts of the Southwest. These Mice live in burrows in the ground and in sandy districts one has little difficulty in finding their tracks and entrances to subterranean workings. As a rule they are more or less closely associated with other plains-loving Mice such as *Peromyscus* and *Perognathus*, and a trap set on one of the sandy runaways may take all three genera on successive nights. The Scorpion Mice are strictly nocturnal.

There are about four young in a litter and in the southern part of their range these Mice have more than one litter a year. On the northern part of their range, where the summer season is shorter, but one family is raised in a season. Although Grasshopper Mice may be inactive during periods of severe weather, they do not hibernate.

Genus *Reithrodontomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

¹ See A. H. Howell, *North American Fauna*, No. 36, 1914, for a full revision of this genus.

HARVEST MOUSE

Harvest Mouse.—*Reithrodontomys humulis*

and related forms

General Description.—A small, long-tailed Mouse with longitudinally grooved upper incisors. Ears large and prominent; no cheek-pouches; colors of pelage inconspicuous;



FIG. 70. Harvest Mouse

tail slender, sparsely haired; soles of hind feet with six tubercles. Externally bearing a close resemblance to a small, domestic House Mouse, *Mus musculus*. Plate XXX.

Color.—Sexes colored alike.

Upperparts.—Dark brown, darkest along mid-line of back; ears blackish to fuscous; tail above, fuscous, below, grayish white, a clear line of demarcation between upper and lower sides.

Underparts.—Grayish, often washed with light pinkish cinnamon, no conspicuous line of demarcation between color of underparts and color of sides, but rather an insensible merging of the one into the other.

Immature pelage more fuscous than adults, with less brown.

Measurements.—Total length, 4.6–5 inches; tail vertebræ, 2.1–2.4 inches; hind foot, .6–.7 inch; ear, .4 inch.

Geographical Distribution.—Southeastern United States from Atlantic to Pacific and north in the Great Plains district.

Food.—Seeds, grains, fruit, and green vegetation, mostly of native species and rarely of cultivated varieties.

Enemies.—Hawks, Owls, Snakes, Weasels, Foxes, Coyotes, and small carnivores.

Species and Subspecies of the genus *Reithrodontomys*

Subgenus *Reithrodontomys*

Humulis Group

Eastern Harvest Mouse.—*Reithrodontomys humulis humulis* (Audubon and Bachman).

As described above. Found in "Southeastern United States, east of the Alleghenies, from southern Virginia to central Florida." (Howell)

Small-eared Harvest Mouse.—*Reithrodontomys humulis impiger* (Bangs).

Closely resembling typical *humulis* in size and color, but ears much smaller, .35 of an inch from notch. Found in "Northern Virginia and mountains of West Virginia." (Howell)

Merriam Harvest Mouse.—*Reithrodontomys humulis merriami* (Allen).

Blacker and with more gray on upperparts; ears smaller and blacker. Total length, 4.3–5.1 inches; tail vertebræ, 2–2.4 inches; hind foot, .65 inch. Above, pinkish cinnamon mixed with blackish which predominates along back to form dorsal stripe; ears blackish brown. Found in "Coast region of east Texas and southern Louisiana north to northeastern Kentucky and West Virginia; east to Alabama; limits of range imperfectly known." (Howell)

Pallid Harvest Mouse.—*Reithrodontomys albescens albescens* Cary.

Upperparts (summer) ochraceous buff mixed with blackish, which is densest along median line, lighter on sides, sometimes with much gray over upperparts. Underparts clear white. Total length, 4.8–5.2 inches; tail vertebræ 2–2.2 inches; hind foot, .65 inch. Found in "Sand-hill region of

HARVEST MOUSE

Nebraska and western South Dakota; west to Loveland, Colo." (Howell)

Little Gray Harvest Mouse.—*Reithrodontomys albescens griseus* (Bailey).

Darker than typical *albescens*; upperparts (summer) light ochraceous buff mixed with blackish, darkest along median



FIG. 71. Distribution of the subspecies of *Reithrodontomys humulis* and *Reithrodontomys albescens*, after A. H. Howell

1. *Reithrodontomys albescens albescens*
2. *Reithrodontomys albescens griseus*
3. *Reithrodontomys humulis merriami*
4. *Reithrodontomys humulis humulis*
5. *Reithrodontomys humulis impiger*

line, forming an indistinct dorsal stripe. Total length, 4.7-5.8 inches; tail vertebræ, 2.1-2.4 inches; hind foot, .6 inch. Found in "Southern Nebraska, Kansas, Oklahoma, central and western Texas, and eastern New Mexico. Limits of range imperfectly known." (Howell)

Megalotis Group

San Luis Valley Harvest Mouse.—*Reithrodontomys montanus* (Baird).

Winter pelage.—Light buff above, heavily washed with blackish along back, but with no distinct median line; ears dark brown; tail bicolor, brown above, white below; under-

parts white. Total length, 4.7–5.6 inches; tail vertebræ 2–2.6 inches; hind foot, .65 inch. Found in "San Luis Valley, Colo." (Howell)

Desert Harvest Mouse.—*Reithrodontomys megalotis megalotis* (Baird).

Larger than *montanus*. Total length, 5.1–5.8 inches; tail vertebræ, 2.6–3.1 inches; hind foot, .7 inch; ear, .5 inch. Upperparts, summer, light ochraceous buff mixed with blackish brown, darkest along dorsal line; ears drab, with a few ochraceous buff hairs about base; underparts and feet white. Found "From northern Nevada and southern Idaho south to Zacatecas, Mexico; occupying the greater part of Nevada, Arizona, and Utah (except eastern part); southern New Mexico; western Texas (west of Pecos River); desert regions of southern and northeastern California. . . ." (Howell)

Aztec Harvest Mouse.—*Reithrodontomys megalotis aztecus* (Allen).

Like typical *megalotis* in size and color, but ears larger, .5–.6 inch from notch. Found in "Northern New Mexico, northeastern Arizona, southeastern Utah, and western Colorado, north to Grand Junction and Rifle." (Howell)

Prairie Harvest Mouse.—*Reithrodontomys megalotis dychei* (Allen).

Blacker and with more intensely ochraceous upperparts than typical *megalotis*, ears smaller, tail shorter. Total length, 5.2–5.6 inches; tail vertebræ, 2.3–2.6 inches; hind foot, .6–.7 inch; ear from notch, .45 inch. Found in "Greater part of Kansas, Nebraska, Iowa, Missouri, and South Dakota; southern North Dakota; southeastern Montana; eastern Colorado and eastern Wyoming." (Howell)

Dusky Harvest Mouse.—*Reithrodontomys megalotis nigrescens* Howell.

Blacker and less buffy above than typical *megalotis*. Upperparts, winter, pale ochraceous buff mixed with blackish, darkest dorsally; in summer browner than in winter. Total length, 5.6–6.1 inches; tail vertebræ, 2.5–3 inches; hind foot, .65 inch. Found in "Eastern Oregon and western Idaho; north to Prescott, Wash., south to Bieber, Cal." (Howell)

California Harvest Mouse.—*Reithrodontomys megalotis longicaudus* (Baird).

Darker and smaller than typical *megalotis*, with less gray and more ochraceous than *nigrescens*. Upperparts in winter mixed blackish and ochraceous buff. Total length, 5.2–5.8 inches; tail vertebræ, 2.8–3.2 inches; hind foot, .65 inch. Found in "Greater part of western California, east to the foothills of the Sierra Nevada, San Bernardino, and San Jacinto Ranges; north to Grants Pass, Oreg., and south into northwestern Lower California to about latitude 32°." (Howell)

HARVEST MOUSE

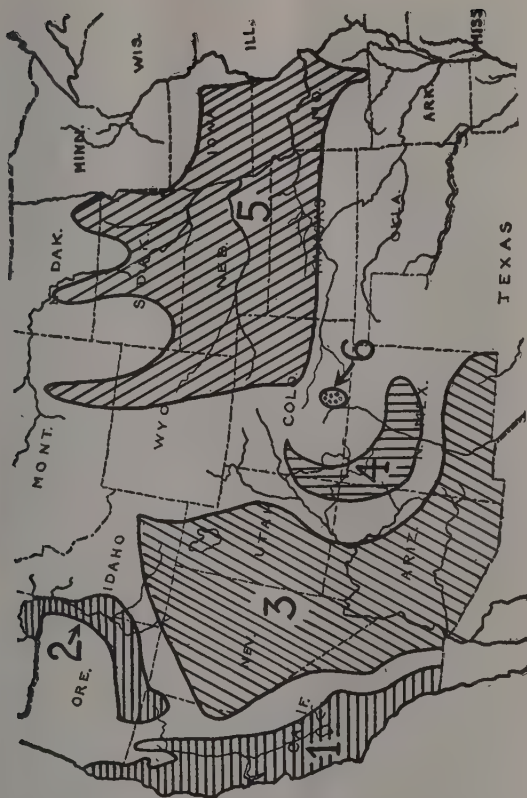


FIG. 72. Distribution of *Reithrodontomys montanus* and the subspecies of *Reithrodontomys megalotis*, north of Mexico, after A. H. Howell

1. *Reithrodontomys megalotis longicaudus*
2. *Reithrodontomys megalotis nigrescens*
3. *Reithrodontomys megalotis megalotis*
4. *Reithrodontomys megalotis aztecus*
5. *Reithrodontomys megalotis dychei*
6. *Reithrodontomys montanus*

Chiricahua Harvest Mouse.—*Reithrodontomys megalotis arizonensis* (Allen).

Resembling typical *megalotis* in size, but tail longer, pelage darker and more ochraceous. Closely similar to *longicaudus*, but redder on head, blacker on ears, and grayer on tail. Upperparts ochraceous buff thickly sprinkled with black, face buffy; underparts white, with ochraceous pectoral area; tail above, mouse-gray, below, grayish white. Total length, 5.8–6.1 inches; tail vertebræ, 3–3.2 inches; hind foot, .65 inch. Known only from the type locality, Rock Creek, Chiricahua Mountains, Arizona, about 8000 feet altitude.

Catalina Harvest Mouse.—*Reithrodontomys catalinæ* Elliot.

Larger and paler than *megalotis longicaudus*. Upperparts (spring pelage), light ochraceous buff mixed with blackish brown, darkest dorsally but lacking a definite stripe; tail bicolor, brown and white; underparts white, with buffy pectoral spot. Total length, 6.6–7 inches; tail vertebræ, 3.6–4 inches; hind foot, .75 inch. Found only on Santa Catalina Island, California.

Red-bellied Harvest Mouse.—*Reithrodontomys raviventris raviventris* Dixon.

Resembling *megalotis longicaudus*, but reddish below and upperparts darker. Upperparts, pinkish cinnamon mixed with black, most darkened on dorsal area; underparts pinkish cinnamon, occasionally with a small white chin spot; hind feet and tail fuscous to sepia, tail not sharply bicolor only slightly lighter on underside; toes whitish; front feet sepia, sometimes washed with buffy white. Total length, 4.8–5.8 inches; tail vertebræ, 2.2–3 inches; hind foot, .65 inch. Found in "Salt marshes of San Francisco Bay, Cal." (Howell)

Petaluma Marsh Harvest Mouse.—*Reithrodontomys raviventris halicætes* (Dixon).

Larger than typical *raviventris* and underparts white instead of cinnamon. Larger and darker than *megalotis longicaudus* and with large white patch on throat. Upperparts, ochraceous buff with heavy mixture of black along back; underparts white, occasionally with irregular blotches of ochraceous buff; feet white or buffy; tail fuscous above, grayish below; a white patch on throat and sides of mouth, the hairs white to their bases. Total length, 6–6.6 inches; tail vertebræ, 3–3.4 inches; hind foot, .7–.75 inch. Found in "Salt marshes of San Pablo Bay, Suisun Bay, and the lower San Joaquin and Sacramento Rivers." (Howell)

Fulvescens Group

Rio Grande Harvest Mouse.—*Reithrodontomys fulvescens intermedius* (Allen).

Upperparts, light ochraceous-buff, with heavy mixture of blackish brown along back; sides brighter; feet white;

underparts white, sometimes touched lightly with buff; tail brown above, grayish white below. Total length, 6.4-7.2 inches; tail vertebræ, 3.5-4.1 inches; hind foot, .8 inch. Found in "Southern Texas and adjacent parts of Mexico from Del Rio to Brownsville; east to Bexar and Bee Counties north to Wichita Mountains, Okla." (Howell)

Golden Harvest Mouse.—*Reithrodontomys fulvescens auran-tius* (Allen).

Resembling *intermedius* but richer and darker in coloration. Upperparts ochraceous tawny, much darkened by mixture of blackish brown; sides rich ochraceous or tawny; underparts grayish white, often washed with pale buff. This subspecies appears to be very variable in intensity and tone of coloration. Total length, 6.2-7 inches; tail vertebræ, 3.4-4 inches; hind foot, .8 inch. Found in "Louisiana (west of the Mississippi River), southern and east-central Arkansas, eastern Texas, and eastern Oklahoma; north to southwestern Missouri (Carthage). Confined to Lower Austral Zone." (Howell)

* * * * *

Harvest Mice are small, rather dull-colored creatures which are seldom seen. They are denizens of grassy localities and are more or less restricted to the warmer zones, the genus reaching its highest development in Central America. The best field character for separating Harvest Mice from other small Mice is the presence of the grooved upper incisors.

These Mice build grass nests which are placed either on the ground or in low vegetation; sometimes a deserted bird nest is used. Harvest Mice do not hibernate and are active both day and night. They are not as abundant as most other Mice, and only rarely do damage to crops.

There are probably several litters of young born annually, from two to four in a litter.

Genus *Baiomys*

Formerly a subgenus of *Peromyscus* to which it is closely related (see page 348).

Size very small, total length (in the United States species) about 4 inches; tail less than half total length; ears comparatively small, rounded; soles of hind feet naked or nearly so, and with six tubercles.

Taylor Baiomys.—*Baiomys taylori taylori* (Thomas).

General color grayish. Upperparts pale drab with heavy sprinkling of dusky; no contrasting markings about eye, at

base of whiskers, nor along lateral line; ears colored like rest of upperparts; tail faintly bicolored, dusky above, smoke-gray below; underparts smoke-gray, with tinge of buffy. Total length, 3.5-4.4 inches; tail vertebræ, 1.4-1.8 inches; hind foot, .54-.60 inch; ear from notch (in dry specimens), .35-.40 inch. Found in "Southern Texas from the vicinity of Matagorda Bay westward to Bexar County and thence south to the Rio Grande; . . . Lower Sonoran Zone." (Osgood)

Dark Baiomys.—*Baiomys taylori subater* (Bailey).

Darker than typical *taylori*. Upperparts, in general tone, varying from dark grayish brown or pale reddish sepia to almost black (in mid-dorsal region); sides more buffy; underparts buffy, paler and grayer on throat. Total length, 3.5-4.2 inches; tail vertebræ, 1.5-1.8 inches; hind foot, .56-.60 inch; ear from notch (in dry specimens), .32-.38 inch. Found in "Coast region of southeastern Texas from the vicinity of Matagorda Bay eastward. Austroriparian Zone." (Osgood)

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In general, the habits of *Baiomys* are probably those of *Peromyscus*. These tiny Mice live in weeds and brush or in open fields and meadows, and make small round holes. Although fairly common in some places, the members of the genus *Baiomys* have a very limited distribution in the United States, and not very much has been written on their life-histories. They make nests in their burrows and also have cavities below ground for the storage of food. In grassy localities they make surface runways very like those of Meadow Mice.

The number of young in a litter is small, two or three.

Genus *Peromyscus*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

White-footed Mouse.—*Peromyscus maniculatus* and related forms

Names.—White-footed Mouse; Deer Mouse; Vesper Mouse; Wood Mouse. Plates XXIX and XXX.

General Description.—A Mouse of medium size; tail long, about half of total length, rather well haired, with scaly

¹ For a very full and complete revision of this genus see Wilfred H. Osgood, *North American Fauna*, No. 28, 1909.

WHITE-FOOTED MOUSE

annulations; ears of good size, only thinly covered by hair; eyes rather large; pelage soft; soles of hind feet with six tubercles, covered with hair except about plantar tubercles; color pattern distinctly bicolor, upperparts dark brown, underparts white; nocturnal in habit.

Color.—Sexes indistinguishable in color.

Upperparts.—Dark brown, with yellowish tinge, slightly darkened along median dorsal region from shoulders to base



FIG. 73. White-footed Mouse

of tail; blackish about eyes and base of whiskers; ears dark, edged with grayish; a small tuft of woolly white hairs at anterior base of ear; tail brownish black above, white below, with clear line of demarcation between; feet white.

Underparts.—Clear white, but with some of the slate-colored basal pelage showing through in places.

Immature.—Upperparts a dark mixture of black and buff; dorsal region almost completely black; tail black above; ears black, edged with whitish.

Very Young.—Slate-gray with whitish wash.

Measurements.—Total length, 7-8 inches; tail vertebræ, 3-3.8 inches; hind foot, .8-.9 inch.

Geographical Distribution.—Practically all of North America south of 60° north latitude; in the west north to 65°.

Food.—Mostly seeds and grains, small nuts and dry vegetable food as contrasted with the green and succulent diet of the Meadow Mice; rarely carnivorous.

Enemies.—Preyed upon by many species of Owls, some of the Hawks, Weasels, Foxes, and practically all of the small carnivorous mammals, Snakes.

Species and Subspecies of the Genus *Peromyscus*.

This is a very large and widely-ranging genus and its members are generally the commonest small mammals of any given region. However, the differences between the various forms are often too subtle to depict in a short, written description and in many cases the most satisfactory basis for identification will be the geographical distribution. The various subspecies frequently merge insensibly into one another, so that it may be difficult to assign individual specimens if they come from such an area of intergradation. Most of the forms of this genus conform to a bicolored pattern, that is, clear white underparts in marked contrast to darker upperparts.

Subgenus *Peromyscus*

Maniculatus Group

Labrador White-footed Mouse.—*Peromyscus maniculatus maniculatus* (Wagner).

As described above. Found in "Hudsonian Zone of northeastern Canada, from the northeastern coast of Labrador to the west side of Hudson Bay and south to the border of the Canadian Zone to meet the range of *P. m. gracilis*." (Osgood)

Le Conte White-footed Mouse.—*Peromyscus maniculatus gracilis* (Le Conte).

Less dusky than typical *maniculatus*, with longer tail and smaller hind foot. Upperparts varying from russet to isabella color. Total length, 7-8 inches; tail vertebrae, 3.2-4.5 inches; hind foot, .8-.88 inch. Found in "North-eastern United States and southern Canada from northern Minnesota east through northern Wisconsin, Michigan, Ontario, Quebec, New York, and western New England. Canadian Zone." (Osgood)

Nova Scotia White-footed Mouse.—*Peromyscus maniculatus abietorum* (Bangs).

Paler and grayer than *gracilis*; upperparts nearly uniform drab, median dark area scarcely developed. Total length,

6.8-7.5 inches; tail vertebræ, 3.3-3.9 inches; hind foot, .8-.88 inch. Found in "Nova Scotia and neighboring parts of eastern Canada; west to central Maine." (Osgood)

Grand Manan White-footed Mouse.—*Peromyscus maniculatus argentatus* (Copeland and Church).

Resembling *abietorum* but with shorter tail and grayer coloration. Upperparts grayish grizzled with dusky. Total length, 6.8-7.8 inches; tail vertebræ, 3.3-3.7 inches; hind foot, .8-.88 inch. Found on "Island of Grand Manan, New Brunswick, Canada." (Osgood)

Grindstone Island White-footed Mouse.—*Peromyscus maniculatus eremus* Osgood.

Darker in color than *abietorum* and tail shorter; paler and smaller than typical *maniculatus*. Upperparts russet sprinkled with dusky; underparts creamy white. Found on Grindstone Island, Magdalen Islands, Quebec.

Cloudland White-footed Mouse.—*Peromyscus maniculatus nubiterræ* (Rhoads).

Resembling *gracilis* but slightly smaller and with broader and more clearly defined dusky dorsal area; pelage very soft. Upperparts Prout-brown made by mixture of russet and blackish; broad median dorsal area blackish brown. Total length, 6.8-7.5 inches; tail vertebræ, 3.5-3.9 inches; hind foot, .8-.84 inch. Found in "Allegheny and Blue Ridge Mountains and adjacent ranges from western Pennsylvania south to western North Carolina, and northeastern Georgia. Canadian Zone." (Osgood)

Boreal White-footed Mouse; Arctic Deer Mouse.—*Peromyscus maniculatus borealis* (Mearns).

Resembling typical *maniculatus*, but tail shorter. Upperparts cinnamon, heavily sprinkled with dusky, no concentration of the darker color along median dorsal area; blackish orbital ring and whisker spot; underparts creamy white. Total length, 6-6.9 inches; tail vertebræ, 2.5-3.1 inches; hind foot, .8 inch. Found in "Interior of northwest Canada; from southeastern Saskatchewan north along the Mackenzie River at least to Fort Norman; west to the upper waters of the Yukon, and thence south to eastern Alberta. Canadian and Hudsonian Zones." (Osgood)

Washington White-footed Mouse.—*Peromyscus maniculatus oreas* (Bangs).

Large in size; tail long; color dark and rich. Compared to *borealis* darker and richer in color; tail and hind foot longer; ears larger. Upperparts cinnamon to russet with heavy sprinkling of dusky most noticeable in middle of dorsal region; feet white but forearms and "ankles" dusky; underparts creamy white. Total length, 7.8-8.6 inches; tail vertebræ, 4.2-4.8 inches; hind foot, .88-.96 inch. Found in "Mountains and coast of western Washington, north to southern British Columbia, south to Columbia River." (Osgood)

Alaska White-footed Mouse.—*Peromyscus maniculatus hylæus* (Osgood).

Slightly darker than *oreas*, with smaller ears and shorter tail. Upperparts russet, heavily mixed with dusky, with dark dorsal saddle. Total length, 7.6–8.2 inches; tail vertebræ, 3.6–4.2 inches; hind foot, .88–.94 inch. Found on "Islands and coast of southeast Alaska west and northwest of the range of *P. m. macrorhinus*, including Prince of Wales, Kupreanof, Mitkof, and Admiralty islands, and the mainland coast from Lynn Canal to Frederick Sound." (Osgood)

Queen Charlotte Island White-footed Mouse.—*Peromyscus maniculatus keeni* (Rhoads).

Resembling *oreas* but ears smaller and tail shorter. Upperparts russet, with dusky mixture darkest in middle of back. Total length, 7.5–8.5 inches; tail vertebræ, 3.8–4.5 inches; hind foot, .88–.92 inch. Found on "Moresby and Graham islands, Queen Charlotte Group, British Columbia." (Osgood)

Yukon White-footed Mouse.—*Peromyscus maniculatus algidus* Osgood.

Resembling *hylæus* but paler and grayer; tail and ears shorter than in *oreas*. Upperparts cinnamon, with dusky mixture lighter on sides and heaviest on middle of back; dusky orbital ring and whisker spot less conspicuous than in *hylæus*. Total length, 7.1–8.2 inches; tail vertebræ, 3.3–4 inches; hind foot, .88–.94 inch. Found in "Region of the headwaters of the Yukon River from Lake Bennett to the lower part of the Lewes River." (Osgood)

Skeena White-footed Mouse.—*Peromyscus maniculatus macrorhinus* (Rhoads).

Very large and dark-colored. Resembling *oreas* but much larger and not as long tailed, relatively. Upperparts rich warm brown, with russet tinge, darker on mid-back, which is burnt umber; orbital ring and whisker spot sooty; underparts creamy white. Total length, 8–8.9 inches; tail vertebræ, 4.2–4.9 inches; hind foot, .9–1.0 inch. Found on "Mainland coast of northern British Columbia and southern Alaska." (Osgood)

Sagebrush White-footed Mouse.—*Peromyscus maniculatus artemisiæ* (Rhoads).

Resembling *borealis* but rather paler in color. Upperparts, pale cinnamon to brownish fawn, more dusky along mid-back; very little white in subauricular tufts. Total length 6.2–7.6 inches; tail vertebræ, 2.6–3.4 inches; hind foot, .76–.88 inch. Found in "South central British Columbia, northeastern Washington, northern Idaho, western Montana, and western Wyoming. Transition and Canadian Zones." (Osgood)

Saturna Island White-footed Mouse.—*Peromyscus maniculatus saturatus* (Bangs).

Upperparts cinnamon, liberally mixed with blackish to give very dark tone; a cinnamon line along sides separating dark upperparts from creamy white underparts and extending down to heels. Total length, 7.2 inches; tail vertebrae, 3.1 inches; hind foot, .88 inch. Found only on Saturna Island, British Columbia.

Hollister White-footed Mouse.—*Peromyscus maniculatus hollisteri* Osgood.

Dark in color like *saturatus*; lateral line not so sharply defined; skull larger and heavier, molar teeth larger. Known only from San Juan Island, San Juan County, Washington.

Puget Sound White-footed Mouse.—*Peromyscus maniculatus austerus* (Baird).

Size medium, color dark; resembling *oreas* but smaller and more sooty in color. Upperparts brownish fawn, well mixed with sooty, especially along back; no white at anterior base of ear. Total length, 6.5–7.6 inches; tail vertebrae, 3.2–3.8 inches; hind foot, .76–.84 inch. Found in "Coast region of Puget Sound, Washington; north to southern British Columbia and including Vancouver Island." (Osgood)

Redwood White-footed Mouse.—*Peromyscus maniculatus rubidus* (Osgood).

Resembling *oreas* but with shorter tail and hind foot. Upperparts cinnamon, plentifully intermixed with blackish along sides, and more so along back to form a broad, dark dorsal band; orbital ring and whisker spot conspicuously black; tuft at anterior base of ear with no white hairs, or at most very few; underparts creamy white. Total length, 7.6–8.1 inches; tail vertebrae, 3.6–4 inches; hind foot, .84–.88 inch. Found on "Coast of California and Oregon from San Francisco Bay to the mouth of the Columbia River." (Osgood)

Gambel White-footed Mouse.—*Peromyscus maniculatus gambeli* (Baird).

Resembling *artemisiae* but smaller. Upperparts ochraceous to ochraceous buff, liberally sprinkled with dusky; no well-defined dusky face markings; underparts creamy white. Occurs in a darker phase. Upperparts more dusky and with more of a vinaceous tinge. Total length, 5.3–7.3 inches; tail vertebrae, 2.6–3.4 inches; hind foot, .8–.87 inch. Found in "Central Washington east of the Cascades, thence south through central and eastern Oregon to California; throughout California except the 'redwood strip' of the northwest coast and except the southeastern desert region and the region east of the Sierra; south into northwestern Lower California. Upper Sonoran to Hudsonian Zone." (Osgood)

Tawny White-footed Mouse; Arizona Wood Mouse.—

Peromyscus maniculatus rufinus (Merriam).

Richly colored, with much tawny. Upperparts ochraceous to tawny ochraceous, with heavy sprinkling of dusky; usually conspicuous tufts at anterior bases of ears white mixed with buffy ochraceous, narrow orbital ring, and small whisker spot dusky in color; "ankles" buffy ochraceous; underparts creamy white. Total length, 5.8–6.8 inches; tail vertebræ, 2.2–3.1 inches; hind foot, .76–.84 inch. Found in "Southern Rocky Mountain region, including the elevated part of New Mexico, scattered peaks and ranges in Arizona, eastern Utah, and the greater part of western and central Colorado. Transition to Boreal Zones." (Osgood)

Osgood White-footed Mouse; Black-eared Deer Mouse.—

Peromyscus maniculatus osgoodi Mearns.

Resembling *borealis* but paler and more ochraceous in color, paler than *rufinus*. Upperparts from cream-buff to pale ochraceous buff, with light sprinkling of dusky; dorsal region not much darker than sides; conspicuous white tufts at anterior bases of ears, clear buffy spots at posterior bases; "ankles" buffy, sometimes touched with dusky; tail sharply bicolored, blackish brown and clear white; underparts clear creamy white. Total length, 5.9–6.8 inches; tail vertebræ, 2.4–2.8 inches; hind foot, .8–.84 inch. Found on "Plains and foothills along the eastern base of the Rocky Mountains from south central Saskatchewan to the Panhandle of Texas, occupying in general the eastern parts of Montana, Wyoming, and Colorado, and the western and southwestern parts of Saskatchewan and the Dakotas. Upper Sonoran and Transition Zones." (Osgood)

Nebraska Deer Mouse.—*Peromyscus maniculatus nebrascensis* (Coues).

Resembling *osgoodi* but slightly smaller in size, ears noticeably smaller, color brighter. Upperparts ochraceous buff, sometimes much brighter and near orange-buff, with light sprinkling of dusky; no well-defined dorsal stripe; occasionally a bright ochraceous buff lateral line present; rest of pelage about as in *osgoodi*. Total length, 5.7–6.3 inches; tail vertebræ, 2.2–2.6 inches; hind foot, .76–.82 inch. Found in "Sandhill region of western Nebraska and adjoining parts of the States of Kansas, Colorado, South Dakota, and Wyoming. Possibly extending north to western North Dakota and south to western Oklahoma." (Miller)

Baird White-footed Mouse.—*Peromyscus maniculatus bairdi* (Hoy and Kennicott). Plate XXIX.

Similar in size to *nebrascensis* but color darker. Upperparts russet or warm brown, heavily sprinkled with black, usually darker along mid-back; a narrow russet lateral line may or may not be present; tufts at bases of ears russet mixed with dusky, only rarely with any white hairs; blackish upperside

of tail sharply marked off from white underside. Total length, 5.6-6.4 inches; tail vertebræ, 2.2-2.8 inches; hind foot, .72-.76 inch. Found in "Prairie region of the upper Mississippi Valley in southern Wisconsin, Minnesota, Illinois, Indiana, eastern Ohio, Iowa, Missouri, Oklahoma, and the eastern or humid parts of Kansas, Nebraska, South Dakota, and North Dakota; north to southern Manitoba. Upper Austral and Transition Zones, meeting the range of *P. m. nebrascensis* along the border between the humid and the arid subdivisions." (Osgood)

Pallid White-footed Mouse.—*Peromyscus maniculatus pallescens* (Allen).

Smaller and paler than *bairdi*, which it otherwise resembles. Upperparts pale russet with light sprinkling of dusky, darkest on back; ochraceous buff spots at anterior bases of ears and about base of tail in interfemoral region; "ankles" lightly washed with brownish; tail dusky brownish on upperside, white below; underparts creamy white. Total length, 4.8-5.2 inches; tail vertebræ, 2-2.1 inches; hind foot, .6-.68 inch. Found in "Central Texas, from the vicinity of the northern boundary at Gainesville south to the region immediately west of Corpus Christi Bay. Lower Sonoran Zone." (Osgood)

Chihuahua Plains Mouse.—*Peromyscus maniculatus blandus* (Osgood).

Occurring in two color phases, buff or gray; size rather small but larger than *pallescens*. Upperparts (gray phase) pale vinaceous buff lightly sprinkled with dusky to produce a general effect of grayish drab; white and vinaceous buff ear tufts conspicuous; buff phase, pinkish buff above, with dusky mixture to produce a pale cinnamon effect. Total length, 5.8-6.9 inches; tail vertebræ, 2.4-3 inches; hind foot, .84-.88 inch. Found in "Lower Sonoran Zone of western Texas from the Pecos Valley westward; north along the Pecos Valley and other Lower Sonoran valleys of southern New Mexico to about latitude 34° north; south in Mexico. . . ." (Osgood)

Sonoran White-footed Mouse.—*Peromyscus maniculatus sonoriensis* (Le Conte).

General appearance much like that of *osgoodi* but slightly darker and with longer tail. Found as two color phases but not as dimorphic in color as *blandus*. Pale, and prevailing, phase: upperparts ochraceous buff finely mixed with dusky which is rather uniform over back and sides; broad white edging on ears which are dusky; tufts at bases of ears with pure white hairs anteriorly, but mainly ochraceous buff; no well-defined dusky orbital ring or whisker spot; "ankles" white to buffy with light dusky wash; underparts white to creamy white. Dark phase: upperparts with heavier dusky mixture on ground color of ochraceous to tawny ochraceous; hairs darker at base; dusky face mark-

ings better developed, white at base of ear reduced; "ankles" generally dusky. Total length, 6-7 inches; tail vertebræ, 2.4-3.3 inches; hind foot, .78-.88 inch. Found in "Great Basin region in general. Northern Sonora, southern and western Arizona and Utah, exclusive of the higher mountains, . . . southern and eastern California east of the Sierra Nevada and the San Bernardino and associated ranges, practically all of Nevada, and parts of southeastern Oregon and south-central Idaho." (Osgood)

San Clemente Island White-footed Mouse.—*Peromyscus maniculatus clementis* (Mearns).

Resembling *gambeli* but slightly larger and darker; lateral line ochraceous buff, better defined. Total length, 6.2-6.9 inches; tail vertebræ, 2.7-3.1 inches; hind foot, .8-.86 inch. Found only on the following islands of the Santa Barbara group, off coast of southern California,—San Clemente, San Nicolas, Santa Rosa, and San Miguel.

Catalina White-footed Mouse.—*Peromyscus maniculatus catalinae* (Elliot).

"Similar to *P. m. clementis*, but larger; ears larger; tail longer and coarser; skull larger and heavier. Color.—About as in *P. m. clementis*; slightly darker and more vinaceous than in *P. m. gambeli*." Total length, 6.4-8.6 inches; tail vertebræ, 3.5-4.2 inches; hind foot, .84-.92 inch. Found on "Santa Catalina and Santa Cruz islands, Santa Barbara group, off the coast of southern California." (Osgood)

Sitka White-footed Mouse.—*Peromyscus sitkensis sitkensis* Merriam.

Resembling in color and general appearance *maniculatus hylaëus*, but much larger, with largest skull of the group found north of Mexico. "Worn pelage: Sides rich russet or Mars brown, shading on dorsum to Prout brown and sometimes burnt umber; dusky markings about face, forearms, and "ankles" well developed; very little or no white at anterior bases of ears." Total length, 9 inches; tail vertebræ, 4.5 inches; hind foot, 1.06 inches. Found on "Baranof and Chichagof islands, Alaska." (Osgood)

Prevost Island White-footed Mouse.—*Peromyscus sitkensis prevostensis* (Osgood).

"Similar to *sitkensis*, but with slightly shorter tail and slight cranial characters. Somewhat similar to *macrorhinus*, but hind foot longer and tail shorter; skull decidedly larger and heavier. Color.—Similar to *sitkensis* and *macrorhinus*, but averaging slightly darker. Sides rich Mars brown shading into a broad irregular area of mummy-brown on dorsum." Total length, 8.2-9.2 inches; tail vertebræ, 3.9-4.6 inches; hind foot, 1.1 inches. Found on "Prevost Island, Queen Charlotte Group, British Columbia." (Osgood)

WHITE-FOOTED MOUSE

Polionotus Group

The members of this group are all small and found only in Florida, Georgia, and Alabama.

Old-field Mouse.—*Peromyscus polionotus polionotus* (Wagner). Smallest *Peromyscus* found in the Atlantic States; resembling *bairdi*, but even smaller. Upperparts brownish fawn, finely sprinkled with dusky, only slightly darker along dorsal area and nearly uniform in intensity over entire upperparts; brighter fawn about face and orbital region; orbital ring and ears dusky; tufts at bases of ears whitish mixed with fawn; underparts creamy white, the hairs slate-colored at base except on chin and throat, where they are white from tip to base; tail dusky brown above, white below, sharply differentiated. Total length, 5–5.5 inches; tail vertebræ, 1.6–2.1 inches; hind foot, .62–.71 inch. Found in "Open fields of the interior of northern Florida and southern Georgia." (Osgood)

Beach Mouse.—*Peromyscus polionotus niveiventris* (Chapman). Slightly larger than typical *polionotus* and color paler. Upperparts pale ochraceous buff, finely sprinkled with brownish dusky; paler over shoulders and nape, brighter on head and back; underparts everywhere clear creamy white from tips to roots of hair, except along lateral line where the hairs are slate-colored at base; tail pale brownish buff above, buffy white below and without sharp line of demarcation between upper and lower sides. Total length, 5.1–6.1 inches; tail vertebræ, 2–2.4 inches; hind foot, .68–.76 inch. Found along "Sandy beach region of the eastern coast of Florida." (Osgood)

Anastasia Island White-footed Mouse.—*Peromyscus polionotus phasma* (Bangs).

Like *niveiventris*, but paler and with more white markings. Upperparts pinkish buff tinged with gray along mid-dorsal region; conspicuous white areas or spots on nose, above eye, and at base of ear; feet and legs white; tail unicolor, white, with faint traces of a dusky median band along upper-side; underparts clear white to roots of hair. An extremely pale form throughout. Total length, 5.5 inches; tail vertebræ, 2.1 inches; hind foot, .75 inch. Found only on Anastasia Island, Florida.

Rhoads White-footed Mouse.—*Peromyscus polionotus rhoadsi* (Bangs).

Smaller and darker than *niveiventris*. Upperparts ochraceous buff, shading toward dark ochraceous buff, lightly mixed with dusky; tail unicolor, white, for terminal half, brownish buffy above, white below for basal half; underparts creamy white, slate color at base of pelage showing only as a trace; thighs yellowish on inner side. Total length, 5 inches; tail vertebræ, 1.8 inches; hind foot, .66

inch. Found in "West central Florida, in the vicinity of Tampa Bay." (Osgood)

White-fronted Beach Mouse.—*Peromyscus polionotus albifrons* Osgood.

Like *rhoadsi*, but with more extensive white markings. Upperparts ochraceous buff to grayish fawn; a white area on end of nose and along median line to between eyes; white edging of ear broad and a few white hairs at base of ear; tail white above and below except for pale brownish upper-side for basal third or fourth of its length; underparts white to roots or with only traces of slate-colored bases, white of underparts extending up over throat to eyes; thighs, legs, and feet white. Total length, 4.8–5.5 inches; tail vertebræ, 1.8–2.1 inches; hind foot, .68–.76 inch. Found along "Coast of western Florida and Alabama." (Osgood)

White-headed Beach Mouse.—*Peromyscus leucocephalus* Howell.

Resembling *phasma* "but color tone of upperparts drab instead of buff; colored dorsal area narrower, the whole of the sides white; entire head and face, except crown, white; paler, more extensively white, and slightly larger than . . . *albifrons* . . . underparts, and limbs white (the hairs white to base); ears whitish at base, becoming mouse gray at tips; tail unicolor, white, with a faint tinge of drab." (Howell) Total length, 5.5 inches; tail vertebræ, 2 inches; hind foot, .74 inch. Found only on Santa Rosa Island, Santa Rosa County, Florida.

Leucopus Group

White-footed Mouse.—*Peromyscus leucopus leucopus* (Rafinesque).

Tail less than half total length; hind foot hairy for proximal two-fifths. Upperparts Mars brown sprinkled with dusky, dorsal region only slightly darker than rest of upperparts; ears dusky and without white tufts at bases; no well-defined orbital ring; feet white; dusky on upperside of forearm, brownish on "ankles"; underparts white, with slate-colored base of pelage showing through somewhat; tail above, dusky brownish, below, white. Total length, 6.2–7.1 inches; tail vertebræ, 2.9–3.2 inches; hind foot, .8–.84 inch. Found in "Western Kentucky south to southern Louisiana, west to Indian Territory, and east around the southern end of the Allegheny Mountains to eastern Virginia. Lower Austral Zone." (Osgood)

Northern White-footed Mouse.—*Peromyscus leucopus noveboracensis* (Fischer).

Paler and somewhat larger than typical *leucopus*, with longer and softer pelage and more hairy tail. Upperparts fawn to cinnamon-rufous or bright tawny with light sprinkling of dusky, heaviest on dorsal region, less on sides; under-

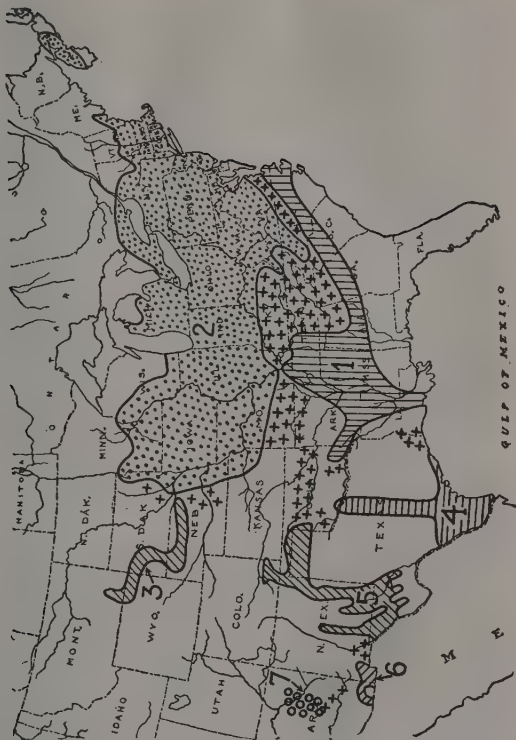


FIG. 74. Distribution of the subspecies of *Peromyscus leucopus*, north of Mexico, after Osgood.

1. *Peromyscus leucopus leucopus*
2. *Peromyscus leucopus noveboracensis*
3. *Peromyscus leucopus aridulus*
4. *Peromyscus leucopus texanus*
5. *Peromyscus leucopus tornillo*
6. *Peromyscus leucopus arizonæ*
7. *Peromyscus leucopus ochraceus*

Crosses indicate areas of intergradation.

parts creamy white. Total length, 6.2–7.5 inches; tail vertebræ, 2.9–3.3 inches; hind foot, .8–.88 inch. Found in "Upper Austral and Transition Zones of the eastern United States and Canada. Extending from Nova Scotia to central Minnesota, thence south through the humid parts of eastern Nebraska and Kansas and eastward to the Atlantic coast, following quite closely the boundary between the Lower and Upper Austral Zones on the south and that between the Transition and Canadian on the north." (Osgood)

Monomoy Island White-footed Mouse.—*Peromyscus leucopus ammodytes* Bangs.

Resembling *noveboracensis*, but paler above and with hair of underparts white to roots. Upperparts fawn, paler on sides; tail pale brownish above, white below; underparts clear white with creamy tinge, hairs white to base over median area and sometimes almost up to lower sides. Total length, 6.5–7.6 inches; tail vertebræ, 2.8–3.5 inches; hind foot, .8–.84 inch. Found only on Monomoy Island, off the coast of Massachusetts, southeast of the Cape Cod Peninsula.

Marthas Vineyard Island White-footed Mouse.—*Peromyscus leucopus fusus* Bangs.

Larger than *noveboracensis*, but otherwise resembling it. Total length, 7.6–8.1 inches; tail vertebræ, 3.4–3.8 inches; hind foot, .86–.94 inch. Found only on the Island of Marthas Vineyard, off the south coast of Massachusetts.

Badlands White-footed Mouse.—*Peromyscus leucopus aridulus* Osgood.

Larger and paler than *noveboracensis*. Upperparts ochraceous buff, lightly sprinkled with dusky; dorsal area very little darker than sides; underparts creamy white. Total length, 6.4–8.2 inches; tail vertebræ, 2.5–3.7 inches; hind foot, .84–.92 inch. Found in "Upper Sonoran Zone of eastern Montana and Wyoming and the adjoining western parts of South Dakota and Nebraska; probably south to Oklahoma and west to eastern Colorado." (Osgood)

Buffy White-footed Mouse.—*Peromyscus leucopus ochraceus* Osgood.

Upperparts bright ochraceous buff, lightly mixed with dusky, slightly darker on dorsal region than on sides, but without a defined dorsal band; tail dusky brownish above, white tinged with buffy below; ochraceous buff or buffy tinge on the white of underparts, feet, and hands. Total length, 6.9–7.2 inches; tail vertebræ, 3.3 inches; hind foot, .9 inch. Found in eastern and central Arizona.

Tornillo Mouse.—*Peromyscus leucopus tornillo* (Mearns).

Resembling *ochraceus* and *aridulus*, but paler, fawn-colored instead of ochraceous. Upperparts fawn, finely lined with dusky; tail indistinctly bicolor, pale brownish and white; underparts clear creamy white. Total length, 6.8–8.1

WHITE-FOOTED MOUSE

inches; tail vertebræ, 3-3.9 inches; hind foot, .84-.96 inch. Found in "Upper Sonoran Zone and part of the Lower Sonoran of western Texas and eastern New Mexico; north to southeastern Colorado and south to northern Durango; northeast to western Oklahoma." (Osgood)

Arizona White-footed Mouse; Apache Wood Mouse.—*Peromyscus leucopus arizonæ* (Allen).

Slightly darker than *tornillo*, but otherwise resembling it. Upperparts varying from fawn to dark fawn, sprinkled with dusky; tail indistinctly bicolored, pale brownish above, white below. Total length, 7.1-8.1 inches; tail vertebræ, 3.1-3.8 inches; hind foot, .88-.96 inch. Found in "South-eastern Arizona and adjacent parts of Mexico and New Mexico." (Osgood)

Texas White-footed Mouse; Texas Gray Wood Mouse.—*Peromyscus leucopus texanus* (Woodhouse).

Slightly smaller and darker than *tornillo*, with shorter pelage and more sparsely-haired tail. Upperparts varying from pale to dark fawn, sprinkled with dusky. Total length, 6.8-7.6 inches; tail vertebræ, 2.8-3.8 inches; hind foot, .8-.9 inch. Found in "Southern Texas . . . extending west to the vicinity of the mouth of the Pecos River, north to about latitude 33° north, east to west side of Galveston Bay. . . . Lower Sonoran Zone." (Osgood)

Gossypinus Group

Cotton Mouse.—*Peromyscus gossypinus gossypinus* (Le Conte).

Tail less than half total length, rather indistinctly bicolored, covered with short hairs, generally with well-defined, dark dorsal band; larger and darker than *leucopus*. Upperparts from bright cinnamon-rufous to deep russet, heavily sprinkled with blackish which forms coarse lines, darkest on back from shoulders to base of tail; grayer on top of head and shoulders; ears brownish and either lacking the whitish edging or else with white greatly reduced; feet white; forearm dusky; tail blackish brown on upperside, white below; underparts white generally strongly tinged with cream color on pectoral region. Total length, 6.4-7.6 inches; tail vertebræ, 2.8-3.5 inches; hind foot, .88-.96 inch. Found in "Lowlands of the southeastern United States from the Dismal Swamp, Virginia, to northern Florida and west to Louisiana. Lower Austral Zone." (Osgood)

Rhoads Cotton Mouse.—*Peromyscus gossypinus megacephalus* (Rhoads).

Larger and paler than typical *gossypinus*. Upperparts brownish to light russet, with less black on dorsal area. Total length, 7.3-8.2 inches; tail vertebræ, 3.1-3.6 inches; hind foot, .92-1.04 inches. Found in "Northern Alabama and western Tennessee, west through Arkansas to eastern

Oklahoma, and thence south through eastern Texas and western Louisiana." (Osgood)

Florida Cotton Mouse.—*Peromyscus gossypinus palmarius* Bangs.

Smaller and paler than typical *gossypinus*. "Color.—Unworn pelage: Similar to that of *gossypinus*, but paler; ground color a shade lighter and dusky mixture more sparse, as a rule not so heavily concentrated in the middle of the



FIG. 75. Distribution of the subspecies of *Peromyscus gossypinus*, after Osgood

1. *Peromyscus gossypinus megacephalus*
2. *Peromyscus gossypinus gossypinus*
3. *Peromyscus gossypinus palmarius*
4. *Peromyscus gossypinus anastase*

Crosses indicate areas of intergradation.

back; orbital ring very narrow; underparts grayish white to creamy or even yellowish white, rarely with a small fulvous pectoral spot." Total length, 6.9–7.3 inches; tail vertebrae, 2.8–3.1 inches; hind foot, .8–.88 inch. Found in "Peninsular Florida." (Osgood)

Anastasia Island Cotton Mouse; Sea Island Cotton Mouse.—*Peromyscus gossypinus anastase* (Bangs).

Resembling *palmarius* in size; paler in color than either *palmarius* or typical *gossypinus*. "Upperparts pale ochraceous buff rather lightly mixed with dusky, which is slightly or not at all concentrated in the mid-dorsal region; orbital ring nearly or quite obsolete; underparts white almost

WHITE-FOOTED MOUSE

entirely concealing undercolor; ears dusky; tail bicolor, brownish dusky above, white below." (Osgood) Total length, 6.7 inches; tail vertebræ, 2.8 inches; hind foot, .85 inch. Found only on Anastasia Island, Florida, and Cumberland Island, Georgia.

Boylli Group

Boyle Deer Mouse; Boyle White-footed Mouse; California Brush Mouse.—*Peromyscus boylii boylii* (Baird).

Tail as long or longer than length of head and body; ears of medium size; underside of hind foot hairy for proximal

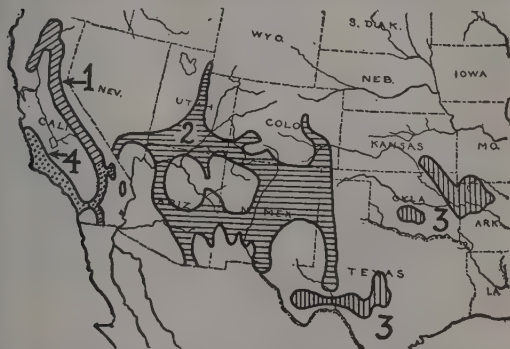


FIG. 76. Distribution of the subspecies of *Peromyscus boylii*, north of Mexico, after Osgood

1. *Peromyscus boylii boylii*
- 2 and 4 *Peromyscus boylii rowleyi*
3. *Peromyscus boylii attwateri*

two-fifths of its length. Upperparts brownish to sepia russet or pale cinnamon, uniformly sprinkled with dusky, no definite dark dorsal band; pale ochraceous buff on lower side of face, arms, and a narrow line along sides; a narrow black ring about eye; no white hairs in tufts at base of ears, which are dusky, with narrow white edging; feet white, "ankles" dusky; tail brownish above, white below, with small "pencil" of long hairs; underparts creamy white. Total length, 7.3–8.1 inches; tail vertebræ, 3.7–4.5 inches; hind foot, .84–.92 inch; ear from notch (in dry skin) .61–.70 inch. Found on "West slopes of the Sierra Nevada mountains from the vicinity of Yosemite north to Mount Shasta, thence along the east slopes of the coast ranges nearly to San Francisco Bay. Upper Sonoran and Transition Zones." (Osgood)

Rowley White-footed Mouse.—*Peromyscus boylii rowleyi* (Allen).

Closely resembling typical *boylii* in everything except color, paler. Upperparts "ochraceous buff uniformly sprinkled with dusky; sides like back, except a relatively broad lateral line of ochraceous buff unmixed with dusky; nose and postorbital region grayish; narrow orbital ring blackish; ears dusky, faintly edged with whitish; underparts creamy white; tail dusky brownish above, white below; feet white, dusky of hind legs extending to tarsal joints, but not sharply contrasted." Total length, 7.2–8.3 inches; tail vertebræ, 3.6–4.4 inches; hind foot, .84–.92 inch. Found in "Mountains of southern California, northern Lower California, southern Nevada, Utah, Colorado, Arizona, New Mexico, western Texas, and south in Mexico. . . ." (Osgood)

Attwater White-footed Mouse; Attwater Brush Mouse.—*Peromyscus boylii attwateri* (Allen).

Larger than *rowleyi*, colored about as in typical *boylii*. Upperparts pale cinnamon sprinkled finely with dusky; slightly grayish about head; ochraceous buff on lower sides of face, narrow lateral line and occasionally a small spot on pectoral area; dusky on hind leg down as far as upperside of hind foot; underparts creamy white. Total length, 7.5–8.7 inches; tail vertebræ, 3.8–4.5 inches; hind foot, .92–1.0 inch. Found in "South central and parts of western Texas; north to eastern Oklahoma, central Missouri, and southern Kansas. Chiefly confined to rocky cliffs in upper Sonoran Zone." (Osgood)

Pectoralis Group

Lacey White-footed Mouse.—*Peromyscus pectoralis laceianus* Bailey.

Tail long, generally slightly more than half the total length; resembling *attwateri* somewhat, but lacking the dusky markings on the tarsal joint. Upperparts varying from pinkish buff to ochraceous buff mixed with more or less dusky; dorsal area about as dark as rest of upperparts; no white at base of ears; feet white without dusky tinge on tarsal joint; tail pale brown above, white below; underparts creamy white. Total length, 7.2–7.7 inches; tail vertebræ, 3.8–4.0 inches; hind foot, .88–.92 inch. Found in "West central Texas, from the vicinity of Austin to the Big Bend of the Rio Grande. . . ." (Osgood)

Durango White-footed Mouse.—*Peromyscus pectoralis eremicoides* (Osgood).

Resembling *laceianus* in color; "ears quite small; . . . soles of hind feet usually slightly hairy proximally but sometimes naked, at least medially. Upperparts mixed pinkish buff and dusky, . . . ; lateral line pinkish buff; facial region between eye and ear grayish; underparts pure creamy white

WHITE-FOOTED MOUSE

without trace of pectoral spot; feet white, no dusky marking on tarsal joint; tail pale grayish dusky above, white below." (Osgood) Total length, 7.6 inches; tail vertebrae, 4.2 inches; hind foot, .8 inch. Found from north central Mexico northward into southern Arizona.

Truei Group

True White-footed Mouse.—*Peromyscus truei truei* (Shufeldt).

Ears very large, about as long as hind foot; pelage long and soft; tail about half of total length; hind foot generally

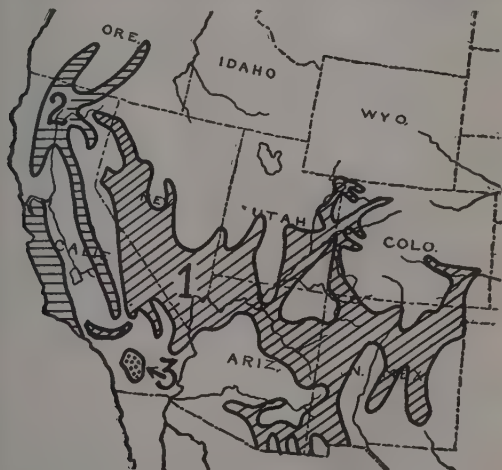


FIG. 77. Distribution of the subspecies of *Peromyscus truei*, north of Mexico, after Osgood

1. *Peromyscus truei truei*
2. *Peromyscus truei gilberti*
3. *Peromyscus truei martirensis*

densely haired for about two-fifths of its length (proximal). Upperparts varying from ochraceous buff to pale ochraceous buff, or pinkish buff mixed with varying amounts of dusky; grayish on face and nose; dusky on narrow orbital ring and small spot at base of whiskers; ears thickly haired, dusky brownish within, grayish white without; no contrasting color in tufts at bases of ears; feet white, slight dusky tinge

on tarsal joint; tail indistinctly bicolor, brownish dusky above, white below; a clear ochraceous lateral line between upper and lower parts, less distinct in worn pelages; underparts creamy white. Total length, 7.2-8.4 inches; tail vertebræ, 3.5-4.5 inches; hind foot, .86-.96 inch; ear from notch (in dry skin), .86-.98 inch. Found in "Southwestern United States and northern Mexico from southern California (east of the Sierra and San Bernardino ranges), across southern Nevada, southern Utah, Arizona, to west central New Mexico, and thence south. . . ." (Osgood)

Gilbert White-footed Mouse.—*Peromyscus truei gilberti* (Allen).

Resembling typical *truei*, but darker in color, pelage not quite as silky, ears smaller. Upperparts from deep ochraceous to tawny, mixed with dusky (more so than in typical *truei*), ochraceous lateral line well defined; blackish orbital ring sharply defined; pectoral spot may or may not be present. Total length, 7.5-8.2 inches; tail vertebræ, 3.5-4.2 inches; hind foot, .88-.96 inch; ear from notch (in dry skin), .72-.84 inch. Found in "Mountains and foothills of the interior of California and the coast south of San Francisco Bay; north to central Oregon. Chiefly Upper Sonoran Zone." (Osgood)

Martir White-footed Mouse.—*Peromyscus truei martirensis* (Allen).

Practically indistinguishable in color from typical *truei*, but tail rather longer. Total length, 8.2-8.9 inches; tail vertebræ, 4.5-4.9 inches; hind foot, .96 inch; ear from notch (in dry skin), .84-.92 inch. Found in "northern Lower California, and northward to the San Jacinto and San Bernardino mountains of southwestern California." (Osgood)

Long-nosed White-footed Mouse.—*Peromyscus nasutus* (Allen).

Ear not quite as large as in typical *truei*, but nearly so; tail finely annulated. Upperparts varying in general tone from grayish wood-brown to pale grayish fawn, but never showing a decided ochraceous tinge; rest of pelage much as in *rowleyi*. Total length, 7.2-8.4 inches; tail vertebræ, 3.6-4.4 inches; hind foot, .88-.96 inch; ear from notch (in dry skin), .74-.84 inch. Found in "Mountains of Colorado, New Mexico, eastern Arizona, and western Texas, chiefly east of the Continental Divide." (Osgood)

Subgenus *Ochrotomys*

Nuttalli Group

Plantar tubercles six, with a seventh rudimentary tubercle; abdomen suffused with color of upperparts; immature pelage

about the same as adult; pelage very soft and dense; hair on ears same color as that of upperparts.

Northern Golden Mouse.—*Peromyscus nuttalli nuttalli* (Harlan).

Hind foot hairy for half its extent, abdomen ochraceous. Upperparts rich tawny ochraceous, only slightly sprinkled with dusky along dorsal area, less dusky on sides; head and



FIG. 78. Distribution of the subspecies of *Peromyscus nuttalli*, after Osgood

1. *Peromyscus nuttalli nuttalli*
2. *Peromyscus nuttalli aureolus* (this range has been incorrectly copied and should almost touch Number 1 in the northeastern corner of North Carolina)

ears like sides; no orbital ring or whisker spot; feet creamy white; tail pale brownish above, creamy white below; underparts creamy white with ochraceous suffusion on abdomen. Total length, 6.8–7.6 inches; tail vertebrae, 3.2–3.7 inches; hind foot, .76–.80 inch; ear from notch (in dry skin), .58–.65 inch. Found in "Southeastern Virginia and northern North Carolina; west to central Kentucky." (Osgood)

Southern Golden Mouse.—*Peromyscus nuttalli aureolus* (Audubon and Bachman).

Resembling typical *nuttalli*, but smaller. Color as in *nuttalli*, occasionally very slightly paler. Total length,

6.6-7.3 inches; tail vertebrae, 3.2-3.6 inches; hind foot, .68-.80 inch; ear from notch (in dry skin), .54-.68 inch. Found in "Southeastern United States from North Carolina to northern Florida; west to eastern Texas and Oklahoma. Lower Austral Zone." (Osgood)

Subgenus *Podomys*

Floridanus Group

Plantar tubercles five.

Florida White-footed Mouse.—*Peromyscus floridanus* (Chapman).

Large in size; tail less than half total length, ears large, sparsely haired; sole of hind foot hairy for fifth of length. Upperparts pale ochraceous buff with varying amounts of dusky mixture; more ochraceous along lower sides; tufts at bases of ears pale ochraceous buff mixed with dusky; pelage of ears dusky outside, whitish inside; feet white, forelegs white; upperside of hind feet slightly dusky; tail brownish dusky above, creamy white below; underparts creamy white, frequently with ochraceous buff spot on pectoral region. Total length, 7.6-8.8 inches; tail vertebrae, 3.2-3.8 inches; hind foot, 1.2-1.3 inches; ear from notch, .88-1.0 inch. Found in "The central part of peninsular Florida from coast to coast." (Osgood)

Subgenus *Haplomylomys*

Tail always more than half of total length; plantar tubercles six; molar teeth simple in character, without accessory cusps or with them in a very reduced condition.

Crinitus Group

Canyon Mouse.—*Peromyscus crinitus crinitus* (Merriam).

Pelage long and lax; tail longer than length of head and body, closely covered with long, soft hairs, with a distinct tuft of longer hairs at tip; ears large; sole of hind foot hairy for one-quarter of its extent (proximal). Upperparts a mixture of dusky and pale ochraceous buff; grayish on forehead, nose, and upper face; hands and feet white; tail blackish above, white below, distinctly bicolored; underparts white, often with pectoral spot of weak buff. Total length, 6.9-7.4 inches; tail vertebrae, 3.7-3.9 inches; hind foot, .84 inch; ear from notch (in dry specimens), .62-.70 inch. Found in "Rocky cliffs and canyons of southern Idaho, eastern Oregon, eastern California, northern Nevada, and northwestern Utah. Upper Sonoran Zone." (Osgood)

Buff-breasted Canyon Mouse.—*Peromyscus crinitus auripectus* (Allen).

Resembling typical *crinitus*, but lighter colored and with more buff; tail heavily haired. Upperparts rich ochraceous buff with faint sprinkling of dusky on dorsal area, less dusky on sides; ochraceous buff on head, face, and often on pectoral area; hands and feet white; tail dusky brownish above, white below; ear tufts buffy with occasional mixture of white; underparts creamy white. Total length, 7-7.3 inches; tail vertebræ, 3.6-3.9 inches; hind foot, .80-.84 inch; ear from notch (in dry specimen), .66-.72 inch. "Known from a limited number of localities in northeastern Arizona, southeastern Utah, and adjacent parts of Colorado and New Mexico." (Osgood)

Stephens Canyon Mouse; Palm Desert Mouse.—*Peromyscus crinitus stephensi* (Mearns).

Smaller and paler than *auripectus*. Upperparts pale ochraceous buff uniformly mixed with dusky brownish; a narrow buff lateral line; underparts white to creamy white, buff pectoral spot may or may not be present. Total length, 6.5-7.7 inches; tail vertebræ, 3.5-4.3 inches; hind foot, .76-.80 inch; ear from notch (in dry specimens), .62-.66 inch. Found in "Rocky situations in the Lower Sonoran Zone from northeastern Lower California northward to the desert valleys and ranges of the Death Valley region and eastward across southern Nevada to southwestern Utah and northwestern Arizona." (Osgood)

Californicus Group

Parasitic Mouse.—*Peromyscus californicus californicus* (Gambel). Plate XXX.

Largest *Peromyscus* found in the United States, total length reaching 10 inches or more. Pelage long and soft; tail more than half total length, well haired but not enough to completely conceal annulations; ears very large and membranous, thinly haired; soles of hind feet naked or very nearly so. Upperparts russet to cinnamon mixed with considerable blackish or dark brownish, slightly darker on dorsal area; sides brighter than back; head brownish, cheeks bordered by light russet line below; orbital ring dusky; hands and feet white, the latter with short, dusky stripe reaching down from hind leg; tail bicolored but no sharp contrast between black of upperside and white of lower, base of tail russet below; underparts creamy white. Total length, 9.5-10.4 inches; tail vertebræ, 5.1-5.8 inches; hind foot, 1.04-1.16 inches; ear from notch (in dry specimens), .85-.94 inch. Found in "Upper Sonoran and Transition Zones of the coast region of California from San Francisco Bay south to the vicinity of Santa Barbara, where intergradation with subspecies *insignis* occurs."

(Osgood) This mouse is so named because it is sometimes found living in or about the brush "nests" of *Neotoma fuscipes*, a Wood Rat.

Southern Parasitic Mouse.—*Peromyscus californicus insignis* (Rhoads).

Resembling typical *californicus*, but smaller and paler. Upperparts with less rufous, with less black-tipped hairs over mid-dorsal area; pectoral spot frequently absent or usually reduced; rufous at base of tail, underside, much reduced. Total length, 8.8–9.8 inches; tail vertebræ, 5–5.6 inches; hind foot, 1.0 inch; ear from notch (in dry specimens), .8–.83 inch. Found in "Upper and Lower Sonoran Zones of the western valleys and foothills of southwestern California and thence south into northern Lower California." (Osgood)

Eremicus Group

Desert Mouse; Western Desert Mouse.—*Peromyscus eremicus eremicus* (Baird).

Size medium, tail much more than half of total length, finely annulated and closely covered with short hairs, terminal tuft scarcely noticeable or completely absent; ears practically naked, good sized, membranous; sole of hind foot naked or nearly so; pelage silky to the touch. Upperparts ochraceous buff with varying (with wear) mixture of dusky, finely sprinkled, over entire dorsal area, no region more noticeably darkened than another; a broad ochraceous buff lateral line; tail above, dusky, below, whitish, not markedly bicolored; underparts clear white or white washed with buffy; buffy pectoral spot occasionally present. Total length, 6.9–8.1 inches; tail vertebræ, 3.8–4.3 inches; hind foot, .80–.84 inch; ear from notch (in dry specimens), .69–.71 inch. Found in "Lower Sonoran Zone of southeastern California . . . ; eastward to western Texas, and south to border States of eastern Mexico; northward along the Colorado River, at least to the vicinity of the mouth of the Little Colorado, also extending from the Colorado River along the Virgin Valley to St. George, Utah, and northwestward, crossing southern Nevada, to the Death Valley region of California." (Osgood)

San Diego Desert Mouse; Dulzura White-footed Mouse.—*Peromyscus eremicus fraterculus* (Miller).

Larger than typical *eremicus*, with longer tail, less white on underparts, and more reddish brown or blackish on upperparts. Upperparts, in winter, "cinnamon-rufous richly sprinkled with black, which is somewhat concentrated in middle of back; head with more or less grayish, particularly in postorbital region; underparts creamy white with a small rufous pectoral spot." Or in worn winter pelage, "Ground color cinnamon-rufous, as in winter pelage; tips of hairs not black, but brown or brownish dusky, producing

a more rufescent general effect than in the winter pelage." Total length, 7.6 inches; tail vertebræ, 4.5 inches; hind foot, .8 inch. Found in "Extreme southwestern California, west of the mountains from the vicinity of Los Angeles south to northwestern Lower California." (Osgood)

Anthony Desert Mouse; Apache Desert Mouse.—*Peromyscus eremicus anthonyi* (Merriam).

Intermediate in color between typical *eremicus* and *fraterculus*; ears smaller; pectoral spot generally present. Upperparts rich ochraceous buff with heavy sprinkling of black, uniformly distributed, "head grayish drab, suffused with buff, particularly on cheeks; underparts creamy white, except a prominent ochraceous buff pectoral spot, extending from breast between forelegs almost to middle of belly; tail blackish above and paler below, but not sharply bicolor; feet creamy white, "ankles" dusky." Total length, 7.5–8.1 inches; tail vertebræ, 4.1–4.5 inches; hind foot, .84–.88 inch. Found in "Extreme southeastern Arizona and southwestern New Mexico in the vicinity of the Mexican boundary line and south. . . ." (Osgood)

* * * * *

White-footed Mice share with Meadow Mice the distinction of being the commonest and most widely distributed of the North American small rodents. No matter where one goes, from the Arctic Circle southward, one or more of the various forms of this genus will be found if there is any food supply for rodents to be had. This group is easily modified by evolutionary factors, and we find that there are a great many different species and subspecies of White-footed Mice. These many forms are classified in a few large groups, some of which are elevated to the rank of subgenera, and as a rule specimens may be referred to one of these groups without much difficulty. The final sifting down to an exact identification is quite another proposition and, as has been stated before, can best be accomplished on the basis of the geographical ranges given.

Many of the species of White-footed Mice delight in the cover of fallen logs, piles of rock, and other shelter such as is common in forests and brush land. The open country species live in burrows in the earth or sand and make their presence manifest by the tracks and trails they create in their nightly wanderings. Other species build nests in low brushes, or in many cases, use old nests made by birds. All of the different forms are terrestrial, none known to be arboreal, all are strictly nocturnal, and all are active throughout the year.

There is little about the White-footed Mouse suggestive of

the House Mouse. The former is much more attractive and is quickly recognized by the white underparts, white feet, well-haired tail, and general color pattern of contrasted upper and lower parts. These distinctions are not quite as obvious for some of the desert species of *Peromyscus*, such as *eremicus*, but a little experience soon familiarizes one with the general appearance of this genus and it will not be confused with the introduced *Mus musculus*.

White-footed Mice range from sea-level, or below it (Death Valley), to the limits of plant growth on the crests of the mountain ranges, and from regions of heavy annual precipitation to the most arid deserts. Allowing for the changes in color pattern we have learned to expect, the Mouse shows some other differences that may obscure its identity. The forms from the regions of heavy rainfall are dark, nearly black; those from the rainless deserts are very pale; some of the most specialized have developed large size (*californicus*) or large ears (*truei*), but they are all members of the same large group of closely related species. The food of all species is almost strictly vegetarian, and while White-footed Mice eat grain and the seeds of timothy and pasture grasses, they seldom make serious inroads on crops and are not the economic problem that the Meadow Mice are. Most species of White-footed Mice prefer more cover than they find in a cultivated field and therefore confine their depredations to the margins of the field that meet with undisturbed terrain.

White-footed Mice have interesting habits and make attractive pets; they are gentle and tame quickly. Besides the "squeak" characteristic of most Mice, some of the species of *Peromyscus* have been heard to sing in a fine, high-pitched trill, not unlike a canary.

The number of young in a litter varies from three to seven but is usually four or five. These Mice may have as many as four litters a year, hence young may be seen at almost any time. Seton has noted the appearance of the first brood as April 1st in Manitoba; in warmer regions it would be earlier.

Genus *Oryzomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

¹ See E. A. Goldman, *North American Fauna*, No. 43, 1918, for an extensive review of the North American forms of this large genus.

Rice Rat.—*Oryzomys palustris*

and its subspecies

Names.—Rice Rat; Rice Meadow Mouse. Plate XXX.

General Description.—A Rat somewhat smaller than the House Rat, with rather coarse, long fur; long, sparsely-haired tail; hind foot with sole naked to heel; small and inconspicuous ears which are well haired; vibrissæ or "whiskers" short; color grizzled grayish brown or buffy above, white to cream color below. Frequents meadows and grassy lands; mainly nocturnal.

Color.—Sexes colored alike.

Upperparts brown or buff, grizzled with gray, the color richest on rump, darker on top of head, face, and along mid-line of back; feet whitish; tail brownish above, whitish below; underparts white, sometimes with a light buffy wash.

Young.—Duller colored than adults, brownish or grayish above, whitish below.

Measurements.—Total length, 9.5–10 inches; tail vertebræ, 4.5–5 inches; hind foot, 1.2–1.3 inches.

Geographical Distribution.—Eastern North America from New Jersey to Florida and the Gulf States.

Food.—A variety of grasses, sedges, and foliage of shrubs; rice, and seeds of native plants; some animal food such as small crustaceans, mollusks, and meat.

Enemies.—Small carnivorous mammals such as Weasels, Skunks, Minks, et cetera, Hawks, Owls, and Snakes.

Species and Subspecies of the Genus *Oryzomys*

This is a very large genus, of which more than one hundred and fifty species and subspecies have been described (especially troublesome to identify when the specimens come from the mid-range of the genus, tropical America), but only a few forms reach North America.

Subgenus *Oryzomys*

Swamp Rice Rat.—*Oryzomys palustris palustris* (Harlan).

As just described. Found in "Atlantic coastal areas from southern New Jersey (not yet known from Delaware or Maryland, but doubtless occurs there) south to northeastern Florida, thence westward through southern Georgia to the Gulf coast of Alabama and Mississippi, and north through

Alabama and western Tennessee to southwestern Kentucky, southern Illinois, and parts of southeastern Missouri. Altitudinal range from sea level up along streams to about 500 feet (rarely to 1,000 feet), mainly in Lower Austral

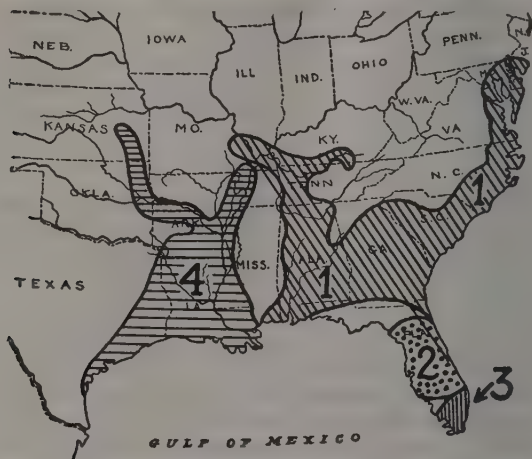


FIG. 79. Distribution of the subspecies of *Oryzomys palustris*, after Goldman

1. *Oryzomys palustris palustris*
2. *Oryzomys palustris natator*
3. *Oryzomys palustris coloratus*
4. *Oryzomys palustris texensis*

Zone, but reaching into Upper Austral Zone in southern New Jersey, southeastern Kentucky, and southeastern Missouri (Marble Hill)." (Goldman)

Central Florida Rice Rat.—*Oryzomys palustris natator* Chapman.

Resembling typical *palustris* but larger and more tawny in color. Total length, 11–12 inches; tail vertebrae, 5.3–6.1 inches; hind foot, 1.3–1.5 inches. Found in "Central Florida, north of Everglades; Austroriparian division of Lower Austral Zone." (Goldman)

Everglades Rice Rat.—*Oryzomys palustris coloratus* Bangs.

Like *natator* but still more tawny in color of upperparts; size of *natator*. Found in "Tropical southern Florida, north to Lake Okechobee." (Goldman)

Texas Rice Rat.—*Oryzomys palustris texensis* Allen.

Similar to typical *palustris* but paler in color, with less warm

coloring above. Color of upperparts grayish brown without the wash of tawny or buffy. Total length, 9-11 inches; tail vertbræ, 4.3-5.3 inches; hind foot, 1.2 inches. Found "From Corpus Christi Bay north and east along the Gulf coast of Texas and Louisiana to the delta of the Mississippi, thence north in the Mississippi Valley to southeastern Missouri; general range reaching southeastern Kansas, probably by way of the Arkansas River valley through Oklahoma (not yet known from Oklahoma); altitudinal range in Austroriparian Zone, mainly below 500 feet; but extending up to about 1,000 feet in Kansas." (Goldman)

Rio Grande Rice Rat.—*Oryzomys couesi aquaticus* (Allen).

Large in size; total length, 11.3-12.4 inches; tail vertebrae, 5.5-7.2 inches; hind foot, 1.3-1.5 inches. Color above, ochraceous buff, paler along sides, below, buffy. Pelage shorter than in the forms of *palustris*. Found in "Rio Grande Valley, from Camargo, Tamaulipas, to Gulf coast near Brownsville, Texas; altitudinal range from sea level to about 300 feet in Lower Sonoran Zone." (Goldman)

* * * * *

The Rice Rats are a large group of southern distribution. North of the Rio Grande they occur in only a narrow strip along the southern border and north along the Atlantic coast to New Jersey. While they may be locally common within this range, the Rice Rats are not a predominating element in the fauna, as they are in much of their southern range.

Our Rice Rats may be easily distinguished from other native rodents on the basis of size, pelage, and color. They are larger than any of the common Mice, *Peromyscus* or *Microtus*, and may be known from the Wood Rats by their coarser pelage and smaller size. Rice Rats bear a superficial resemblance to some of the introduced Rats, especially the Roof Rat, but are smaller and have shorter tails.

These rodents live in grassy localities, marshy meadows, or open brush lands, are prolific breeders, and sometimes are an economic problem in farming districts. The number of young to a litter varies from three to seven but is usually four or five. The first young appear in April or May but there may be a later brood as well.

Genus *Sigmodon*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

¹For a revision of this genus see Vernon Bailey, Proceedings Biological Society Washington, Vol. 15, pp. 101-116, 1902.

Cotton Rat.—*Sigmodon hispidus*

and related forms

General Description.—A medium-sized Rat with long, rather rough, harsh pelage; form robust; ears nearly hidden in



FIG. 80. Cotton Rat .

the fur; tail slightly less than equal to length of head and body, slender, scaly, thinly haired; diurnal and nocturnal.

Color.—Sexes colored alike, no very marked seasonal variation.

Upperparts uniform rich, warm brown, slightly darkened by the blackish underfur showing through; tail dusky above, slightly lighter below; feet dull brown; underparts whitish to grayish white or buffy. Plate XXXIII.

Measurements.—Sexes of equal size. Total length, 10.2 inches; tail vertebræ, 4.2 inches; hind foot, 1.3 inches.

Geographical Distribution.—Southern North America.

COTTON RAT

Food.—Stems, foliage, and seeds of plants, grasses and meadow growths; cultivated crops.

Enemies.—Snakes, Hawks, Owls, Weasels, Foxes and other small carnivores.

Species and Subspecies of the Genus *Sigmodon*

Hispidus Group

Northern Cotton Rat; Eastern Cotton Rat.—*Sigmodon hispidus hispidus* Say and Ord.

As described above. Found in "North Carolina to northern Florida and west to southern Louisiana, in Austroriparian Zone." (Bailey)

Florida Cotton Rat.—*Sigmodon hispidus littoralis* Chapman.

Larger, darker, and with coarser pelage than typical *hispidus*; upperparts grizzled dark gray and black; feet dark gray; upperside of tail black. Total length, 11.3 inches; tail vertebræ, 4.6 inches; hind foot, 1.3 inches. Found in "Eastern part of the peninsula of Florida, from Lake Harney to the Everglades." (Bailey)

Cape Sable Cotton Rat.—*Sigmodon hispidus spadicipygus* Bangs.

Resembling typical *hispidus* in character of pelage, but smaller and less brown; upperparts dark brownish gray. Total length, 11 inches; tail vertebræ, 4 inches; hind foot, 1.25 inches. Found in "The extreme southern part of the peninsula of Florida." (Bailey)

Pine Key Cotton Rat.—*Sigmodon hispidus exsputus* G. M. Allen.

Resembling *spadicipygus* but tail longer and color different. Upperparts pale ochraceous buff, darkest on rump, long hairs white-tipped; underparts white. Total length, 10.2 inches; tail vertebræ, 4.7 inches; hind foot, 1.75 inches. Found on Big Pine Key, Monroe County, Florida.

Texas Cotton Rat.—*Sigmodon hispidus texianus* (Audubon and Bachman).

Smaller and paler than typical *hispidus*. Upperparts grayish brown to dark buffy gray; feet gray. Total length, 10 inches; tail vertebræ, 4.1 inches; hind foot, 1.2 inches. Found in "Approximately the eastern half of Texas, westward to Vernon and San Antonio, and northward to Cairo, Kansas." (Bailey)

Berlandier Cotton Rat.—*Sigmodon hispidus berlandieri* (Baird).

Resembling typical *hispidus* but much paler. Upperparts light buffy to ashy gray; feet light gray; tail bicolor, blackish above, light gray below; underparts white. Total length, 10 inches; tail vertebræ, 4.5 inches; hind foot, 1.3 inches. Found in "Rio Grande and Pecos valleys from Brownsville to El Paso, Texas, and Carlsbad, New Mexico; south to southern Jalisco, Mexico." (Bailey)

Gila Cotton Rat.—*Sigmodon hispidus confinis* Goldman.

A rather small, dark subspecies. Upperparts mixed buff and blackish; ears grayish; tail above, brownish, below, grayish; underparts whitish to grayish. Total length, 11 inches; tail vertebræ, 4.5 inches; hind foot, 1.24 inches. Found in "Upper part of Gila River Valley in southeastern Arizona." (Goldman)

Cienega Cotton Rat.—*Sigmodon hispidus cienegæ* A. B. Howell.

Resembling *confinis* but slightly larger; darker and slightly browner than *eremicus*. Total length, 12.3 inches; tail vertebræ, 5.2 inches; hind foot, 1.4 inches. Found on the upper Santa Cruz River system, Pima County, Arizona.

Western Cotton Rat.—*Sigmodon hispidus eremicus* Mearns.

Slightly larger than typical *hispidus*; paler; pelage softer. Upperparts pale yellowish gray; feet light gray; tail brown above, gray below; underparts whitish. Total length, 11 inches; tail vertebræ, 5 inches; hind foot, 1.36 inches. Found "Along both sides of the lower Colorado River." (Bailey)

Arizona Cotton Rat.—*Sigmodon hispidus arizonæ* Mearns.

Larger and paler than typical *hispidus*. Upperparts light buffy gray; light yellowish touch on nose; underparts white. Total length, 12.8 inches; tail vertebræ, 5 inches; hind foot, 1.0 inch. Found in Yavapai County, Arizona.

Jackson Cotton Rat.—*Sigmodon hispidus jacksoni* Goldman.

Pale and resembling *eremicus*. Upperparts light ochraceous buff mixed with dusky; sides only slightly paler; tail brownish above, grayish below; underparts whitish to grayish. Total length, 10 inches; tail vertebræ, 4.3 inches; hind foot, 1.3 inches. Found in the plateau region near Prescott, Arizona.

Fulviverter Group

Least Cotton Rat.—*Sigmodon minimus minimus* Mearns.

Size small; tail hairy; pelage not hispid. Upperparts clear grizzled gray; feet gray; tail above and below brownish black; underparts buffy. Total length, 9 inches; tail vertebræ, 3.8 inches; hind foot, 1.1 inches. Found in "Mountains of southern New Mexico, Arizona, and northern Mexico." (Bailey)

Goldman Cotton Rat.—*Sigmodon minimus goldmani* Bailey.

Resembling typical *minimus* but darker in color. Upperparts grizzled white, buff and black; ears and tail blackish; feet dark; underparts dark, rich fulvous. Total length, 10.2 inches; tail vertebræ, 4.3 inches; hind foot, 1.24 inches. Found in Quay County, New Mexico.

Yellow-jawed Cotton Rat.—*Sigmodon ochrognathus* Bailey.

Slightly larger than typical *minimus* and with strong orange yellowish tinge about ears, face, and rump. Upperparts yellowish gray; bright ochraceous on nose, about eye, and

base of tail; feet buffy gray; tail blackish above, buffy gray below; underparts white. Total length, 10.4 inches; tail vertebræ, 4.6 inches; hind foot, 1.16 inches. Found in "The Transition Zone top of the Chisos Mountains, Texas. . . ." (Bailey)

* * * * * *

The Cotton Rats are a southern group found in greatest abundance from Mexico to Peru, and reaching their northern limit of distribution in the United States. These Rats look very much like overgrown Meadow Mice, with their long, loose pelage. Like the Meadow Mice, they are creatures of the grass-lands and overgrown, open places. They move about during the day and frequently occur in large numbers. They may prove injurious to crops and, because they are quite prolific, the farmer may find difficulty in controlling them.

Cotton Rats may be easily distinguished from other North American rodents by their size and rough, grizzled pelage. No other Rats have this character of pelage and the only other loose, rough-pelaged rodents, such as the Meadow Mice, are smaller. The number of young may be six or more and there are several litters a year. Cotton Rats do not hibernate but are active throughout the year. They live in burrows or under rocks, logs, or other surface shelters.

Genus *Neotoma*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Wood Rat.—*Neotoma floridana*

and related forms

Names.—Wood Rat; Pack Rat; Trade Rat; Mountain Rat; Brush Rat. Plate XXXIII.

General Description.—A typical Rat in all respects, resembling superficially the domestic House Rat; size fairly large; ears of good size; tail somewhat less than half of total length, tapering, sparsely covered with short hairs; pelage fairly long and soft. Mainly nocturnal but not infrequently active in the daytime.

¹For a full revision of the genus *Neotoma* see E. A. Goldman, *North American Fauna*, No. 31, 1910.

Color.—Sexes colored alike; some seasonal variation but not very marked.

Winter pelage.—Upperparts pale cinnamon, sprinkled with blackish hairs along top of head and back; sides brighter; outer sides of legs brownish drab; feet white; tail dusky above, nearly concolor, slightly paler below; underparts creamy white.

Young duller in color than adults.

Measurements.—Sexes of equal size. Total length, 16.4 inches; tail vertebræ, 7.6 inches; hind foot, 1.54 inches.

Geographical Distribution.—In western North America from 60° southward into Mexico and the Gulf States; Florida and a narrow belt from southern New York to Tennessee.

Food.—Green vegetation such as foliage and grass; fruit, roots, bulbs, bark, fungi, and seeds and nuts. In desert regions cactus is an article of diet. Not often injurious to crops and agricultural enterprises.

Enemies.—Hawks, Owls, Weasels, Foxes, Coyotes, Wildcats, Cacomistles, and Snakes.

Species and Subspecies of the Genus *Neotoma*

Subgenus *Neotoma*

Characterized by round tail, plantar surface of hind foot naked along outer side as far as tarsometatarsal joint, as well as by various cranial characters.

Floridana Group

Florida Wood Rat.—*Neotoma floridana floridana* (Ord).

As described above. Found along "Atlantic coast region from South Carolina to Sebastian, Fla., Austroriparian Zone." (Goldman)

Ruddy Wood Rat.—*Neotoma floridana rubida* Bangs.

Redder in color, somewhat larger than typical *floridana*. Upperparts from cinnamon to dark ochraceous buff, sprinkled along top of head and back with blackish hairs; rest of coloration much as in typical *floridana*. Total length, 16.2 inches; tail vertebræ, 7.8 inches; hind foot, 1.64 inches. Found in "Lower Mississippi Valley and Gulf coast, from southwestern Alabama to eastern Texas, north to eastern Arkansas. Austroriparian Zone." (Goldman).

Illinois Wood Rat.—*Neotoma floridana illinoensis* Howell.

Resembling *rubida*, but grayer in color and tail bicolor instead of unicolor. Upperparts dull buffy with black mixture on head and back; grayish on face, brownish on

outer sides of legs; tail above blackish, below dull white. Total length, males, 15.6–16.5 inches; tail vertebrae, 7.5–8.1 inches; hind foot, 1.44–1.60 inches. Found in "Swamp region of southern Illinois, and southward to northeastern

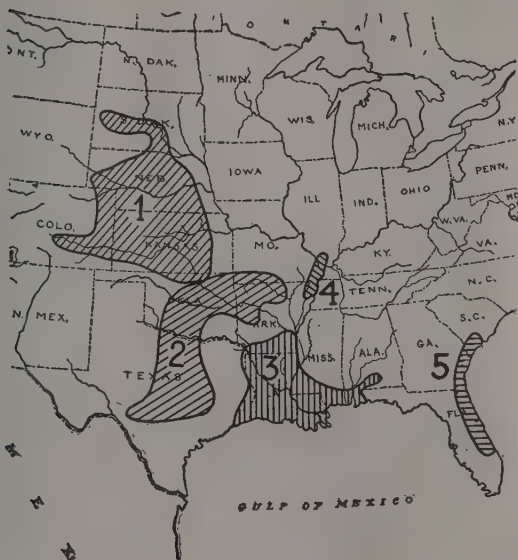


FIG. 81. Distribution of the subspecies of *Neotoma floridana*, after Goldman

1. *Neotoma floridana baileyi*
2. *Neotoma floridana altwateri*
3. *Neotoma floridana rubida*
4. *Neotoma floridana illinoensis*
5. *Neotoma floridana floridana*

Arkansas. Austroriparian division of Lower Austral Zone." (Goldman)

Bailey Wood Rat.—*Neotoma floridana baileyi* (Merriam).

Pelage longer than in typical *floridana*; grayer in color; tail shorter, bicolored. Upperparts (winter) creamy buff to buffy gray sprinkled with dusky on back; sides clearer in tone than back; feet white; tail brownish gray above, white below in sharp contrast; underparts white. Summer pelage

dark rusty brown above. Total length, 14.8 inches; tail vertebræ, 6.4 inches; hind foot, 1.8 inches. Found in "Upper Sonoran and Carolinian divisions of Upper Austral Zone from southwestern South Dakota to southern Kansas, west to Pueblo, Colo." (Goldman)

Kansas Wood Rat.—*Neotoma floridana campestris* (Allen).

Closely allied to *baileyi* but with softer pelage and with slight color differences. Upperparts buffy ochraceous to light yellowish gray; a white stripe from posterior base of ear down side of neck to throat; no ochraceous spot on side of throat in front of foreleg; tail paler below than above but not sharply bicolor. Total length, 14.5 inches; tail vertebræ, 6.2 inches; hind foot, 1.5 inches. Found in western Kansas and eastern Colorado.

Attwater Wood Rat.—*Neotoma floridana attwateri* (Mearns).

Resembling *baileyi* but darker in winter pelage and with smaller teeth. Upperparts (winter) pale vinaceous black with blackish wash along back; grayish on face and outer legs; tail above brownish black, below white; underparts white. Summer pelage, from ochraceous buff to dark rusty brown above. Total length, 14.6 inches; tail vertebræ, 6.7 inches; hind foot, 1.56 inches. Found in "Lower Sonoran and Austroriparian divisions of Lower Austral Zone in central Texas." (Goldman)

Baird Wood Rat.—*Neotoma micropus micropus* Baird.

Paler than typical *floridana*; fur short and somewhat harsh in texture. Upperparts (winter) pale ecru drab, with dusky hairs along back; tail above blackish, below grayish; feet white; underparts white, on pectoral and inguinal regions white to roots of hair. Total length, 14 inches; tail vertebræ, 6.5 inches; hind foot, 1.6 inches. Found in "South-eastern Colorado and southern Kansas, south through Oklahoma and central Texas to southern Tamaulipas, mainly in Lower Sonoran Zone." (Goldman)

Hoary Wood Rat.—*Neotoma micropus canescens* Allen.

Smaller than typical *micropus*, with longer fur and paler color. Upperparts (winter) pale ashy gray with light blackish wash on back; tail grayish brown to blackish above; rest of pelage as in typical *micropus*. Total length, males, 13.2 inches; tail vertebræ, 5.5 inches; hind foot, 1.44 inches. Found "From southeastern Colorado, northwestern Oklahoma, and northern and western Texas, west in New Mexico to the Rio Grande Valley and south to southern Coahuila, mainly in Lower Sonoran Zone." (Goldman)

Albigula Group

White-throated Wood Rat.—*Neotoma albigula albigula* Hartley.

Of medium size; tail bicolor; patch on throat and breast white to roots. Upperparts dull pinkish buff, with thin

blackish wash along back; sides brighter; vinaceous tinge on outer sides of legs; tail above grayish brown, below white; feet white; underparts white. Total length, 13.1 inches; tail vertebræ, 6.1 inches; hind foot, 1.34 inches. Found in "Northern New Mexico to southern Coahuila, Mexico, and from central Texas to western Arizona. Upper and Lower Sonoran Zones." (Goldman)

Mearns Wood Rat.—*Neotoma albigula mearnsi* Goldman.

Paler than typical *albigula* and with more pure white on underparts. Upperparts light buff with sparse sprinkling of black on head and back; underparts white, the fur white to base except along flanks and sides of abdomen where it is pale plumbeous basally; feet white; tail above grayish, below white. Total length, 13.3 inches; tail vertebræ, 6.3 inches; hind foot, 1.3 inches. Found in the very arid desert area from extreme southwestern Arizona southward along the eastern side of the Gulf of California.

Colorado Valley Wood Rat.—*Neotoma albigula venusta* (True).

Larger than typical *albigula*. Upperparts and rest of pelage as in typical *albigula*. Total length, 15.8 inches; tail vertebræ, 7.3 inches; hind foot, 1.5 inches. Found in "Colorado River Valley from northwestern Arizona to Gulf of California and west through southern California to eastern basal slopes of southern Sierra Nevada, San Bernardino, and San Jacinto Mountains. Lower Sonoran Zone." (Goldman)

Warren Wood Rat.—*Neotoma albigula warreni* Merriam.

Grayer than typical *albigula* and with larger hind foot. Upperparts (winter) pale buffy gray with light blackish wash along back; a pale buffy lateral line above white of abdomen; tail above brownish; white on underparts, feet, and underside of tail, with fur white to base on throat and breast. Total length, 12.6 inches; tail vertebræ, 5.4 inches; hind foot, 1.44 inches. Found on "Plains region of southeastern Colorado and northeastern New Mexico. Upper Sonoran Zone." (Goldman)

Intermedia Group

Rhoads Wood Rat.—*Neotoma intermedia intermedia* Rhoads.

Resembling typical *albigula*, but darker and without basally white fur on throat and breast; ears large; tail bicolored. Upperparts (summer) grayish brown, washed with pale buff and sprinkled with black-tipped hairs, thickest on dorsal region; dusky on sides of "ankles;" feet white; tail black above, white below; underparts white, fur slate-colored at base, generally with a faint buffy band across chest. Winter pelage with more black-tipped hairs on upperparts than in summer. Total length, 13 inches; tail vertebræ, 6.4 inches; hind foot, 1.26 inches. Found on "Lower slopes of southern part of Sierra Nevada and coast region of California from Monterey Bay southward and throughout the mountains of

Lower California to near Cape San Lucas. Upper and Lower Sonoran Zones." (Goldman)

Yellow Wood Rat.—*Neotoma intermedia gilva* Rhoads.

Paler than typical *intermedia*, with more yellow and less black on upperparts. Upperparts from creamy buff to pale ochraceous buff, thinly sprinkled with black-tipped hairs along back; sides clearer; less dusky on "ankles" than in *intermedia*; tail above, brownish gray, below, white; underparts white. Total length, 13.2 inches; tail vertebræ, 6.4 inches; hind foot, 1.36 inches. Found on "Arid plains and basal slopes of mountains mainly along the eastern border of the range of *N. intermedia*, from Stanley in Fresno County, Cal., south through northeastern Lower California to the Santa Clara Mountains on the west side of the peninsula. Lower Sonoran Zone." (Goldman)

Mexicana Group

Mexican Wood Rat.—*Neotoma mexicana mexicana* Baird.

"Size medium, tail moderately long, bicolor; upperparts grayish. . . . Color.—*Fresh pelage*: Upperparts grayish buff or buff gray, palest on head, moderately darkened over back by overlying blackish hairs, becoming in worn pelage of old adults somewhat rusty brown; underparts dull white, the fur everywhere deep plumbeous basally; feet white; tail brownish above, white below." (Goldman) Total length, 13 inches; tail vertebræ, 6 inches; hind foot, 1.36 inches. Found on "Desert ranges along the eastern side of the Sierra Madre in Chihuahua and northwestern Durango, and thence northward in the mountains to western Texas, southwestern New Mexico, and southeastern Arizona. Upper Sonoran and Transition Zones." (Goldman)

Colorado Wood Rat.—*Neotoma mexicana fallax* (Merriam).

Like typical *mexicana* in color, but larger in size. Total length, 13.2 inches; tail vertebræ, 6 inches; hind foot, 1.32 inches. Found in "Mountains of Colorado and northern and central New Mexico. Upper Sonoran and Transition Zones." (Goldman)

San Francisco Mountain Wood Rat.—*Neotoma mexicana pine-torum* (Merriam).

Color warmer than that of typical *mexicana*, ochraceous buff instead of grayish buff. Upperparts (October) pale ochraceous buff, sprinkled with black-tipped hairs on back and top of head; rest of pelage as in typical *mexicana*. Total length, 14.3 inches; tail vertebræ, 6.5 inches; hind foot, 1.46 inches. Found in "Plateau region from San Francisco Mountain, Arizona, north to the Grand Canyon and southeastward along the Mogollon Mesa to the Mogollon and Mimbres Mountains in western New Mexico. Transition Zone." (Goldman)

Santa Catalina Mountain Wood Rat.—*Neotoma mexicana bullata* Merriam.

Resembling typical *mexicana*, but with more ochraceous buff. Upperparts pale ochraceous buff, darker along back because of sprinkling of black-tipped hairs; feet and tail as in typical *mexicana*; underparts white, a faint buffy band across breast and ochraceous buff on "arm-pits." Total length, 13.4 inches; tail vertebræ, 6 inches; hind foot, 1.36 inches. Found only in the Santa Catalina Mountains of Arizona.

Desertorum Group**Desert Wood Rat.**—*Neotoma desertorum* Merriam.

Externally resembling *intermedia gilva*; small in size; tail short; ears large; pelage long and silky. Upperparts pale pinkish buffy, sprinkled with black-tipped hairs along dorsal region; sides clearer; creamy buff on middle of face, pinkish buff on sides of neck and sometimes across throat; tail above, brownish to blackish, below, white; feet white; underparts white, sometimes tinged with pinkish buff on abdomen. Total length, 12 inches; tail vertebræ, 5 inches; hind foot, 1.2 inches. Found in "Desert regions in southeastern and northeastern California, Nevada, eastern Oregon, northern and western Utah, east to northwestern Colorado, and south along the west side of the Colorado River to northeastern Lower California. Upper and Lower Sonoran Zones." (Goldman)

Thomas Wood Rat.—*Neotoma lepida lepida* Thomas.

Resembling *desertorum* but yellowish instead of pinkish buffy, and with longer hairs on tail, which is not sharply bicolored. Upperparts yellowish, darkened by black-tipped hairs along back; sides clearer in tone than rest of upperparts; tail pale grayish, only slightly darker above than below; underparts white to creamy, occasionally with buffy suffusion along abdomen, small areas of basally white pelage on throat, inner sides of forelegs, on breast, and on inguinal region. Total length, 11.4 inches; tail vertebræ, 5.5 inches; hind foot, 1.16 inches. Found in "Upper Sonoran Zone in the plateau region of northeastern Arizona, north of the Little Colorado River, and northwestern New Mexico south to Gallup, grading to the southward into *stephensi*." (Goldman) Plate XXXIII.

Stephens Wood Rat.—*Neotoma lepida stephensi* (Goldman).

Larger and darker than typical *lepida*. Upperparts dark grayish buff, darkened along back by dusky hair; pinkish buff on sides; rest of pelage as in typical *lepida*. Total length, 12.2 inches; tail vertebræ, 5.4 inches; hind foot, 1.24 inches. Found in "Upper Sonoran Zone along Hualpai, Mogollon, and White Mountains across central Arizona and from the Burro Mountains to the Zuni Mountains in west-

ern New Mexico, passing farther north into *lepidus*." (Goldman)

Pennsylvanica Group

Allegheny Wood Rat.—*Neotoma pennsylvanica* Stone.

Largest of the round-tailed species of *Neotoma*. "Tail moderately long, well haired, bicolored; ears large, pelage coarse; cranial characters pronounced; no closely related

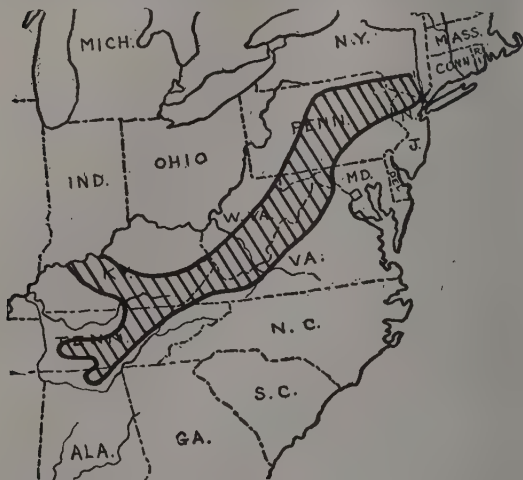


FIG. 82. Distribution of *Neotoma pennsylvanica*, after Goldman

living species known. Color.—*Fresh winter pelage*: Upperparts grayish buff, becoming buffy gray on head, heavily overlaid, especially on back, with blackish; feet and underparts white, the fur pure white to roots, except along sides of belly, where the basal color is pale plumbeous; axillæ creamy buff, tail varying from grayish brown to black above, whitish below." (Goldman) Total length, 17.2 inches; tail vertebrae, 8 inches; hind foot, 1.7 inches. Found in "Appalachian Mountain region from southern New York to northern Alabama, probably including western North Carolina and northern Georgia, and westward to Mammoth Cave, Kentucky, and Lawrenceburg, Tennessee. Alleghenian and Carolinian Zones." (Goldman) Plate XXXIII.

WOOD RAT

Subgenus *Homodontomys*

Characterized chiefly by cranial and dental characters; tail and hind foot as in subgenus *Neotoma*.

Dusky-footed Wood Rat.—*Neotoma fuscipes fuscipes* Baird.

Large in size; tail long, practically unicolored; ears large. Upperparts light ochraceous buff, thickly sprinkled with black-tipped hairs on top of head and back; face grayish; sides clearer in tone than back; ears brownish; white on forefeet, toes of hind feet, and heels; dusky on "ankles," hind feet, muzzle, and orbital ring; tail blackish; underparts pure white except for abdomen which is tinged with creamy buff. Total length, 17.5 inches; tail vertebræ, 8.2 inches; hind foot, 1.7 inches. Found in "Pacific coast region from San Francisco Bay north to Salem, Oregon. Upper Sonoran and Transition Zones." (Goldman)

Streater Wood Rat—*Neotoma fuscipes streatori* Merriam.

Smaller and paler than typical *fuscipes*; tail bicolored; hind feet white from tarsus down. Upperparts pale ochraceous buff with the usual dorsal darkening; feet pure white; tail above blackish, below whitish; rest of pelage as in typical *fuscipes*. Total length, 15 inches; tail vertebræ, 7.5 inches; hind foot, 1.6 inches. Found along "West slope of the Sierra Nevada in California from Tehama County south to Porterville, Tulare County. Upper Sonoran Zone." (Goldman)

Portola Wood Rat.—*Neotoma fuscipes annectens* Elliot.

Distinguished from typical *fuscipes*, chiefly by cranial characters, color essentially the same. Total length, 17.3 inches; tail vertebræ, 8.6 inches; hind foot, 1.7 inches. Found in "Coast region of California from San Francisco Bay to Monterey Bay and thence inland and southward along the small valleys and mountain ranges east of the Santa Lucia Mountains to Carriso Plains, San Luis Obispo County. Upper Sonoran and Transition Zones." (Goldman)

Fort Tejon Wood Rat.—*Neotoma fuscipes simplex* (True).

Smaller than typical *fuscipes*; tail bicolor, feet white. Upperparts pale ochraceous buff, darker along back; tail above, grayish brown, below, whitish; feet white; underparts pure white except for creamy buff tinge on abdomen, a median line of hairs white to roots, pelage elsewhere on abdomen slate-colored at base. Total length, 15.6 inches; tail vertebræ 7 inches; hind foot, 1.6 inches. Found on "Eastern basal slopes of the Sierra Nevada in Inyo and Kern counties, Cal., and through Walker Pass to the foothill region at the southern end of the San Joaquin Valley. Upper Sonoran Zone." (Goldman)

Mohave Desert Wood Rat.—*Neotoma fuscipes mohavensis* Elliot.

Smaller than typical *fuscipes*; color grayer; tail bicolored.

Upperparts brownish gray, heavily sprinkled with black-tipped hairs on back; sides paler than back; ears grayish; feet white, streaked with dusky on hind feet; tail above brownish black, below dull white; underparts white, occasionally with creamy tinge on abdomen. Total length, 15.5 inches; tail vertebræ, 7.3 inches; hind foot, 1.5 inches. Found in "The Mohave Desert, in southern California. Lower Sonoran Zone." (Goldman)

Large-eared Wood Rat.—*Neotoma fuscipes macrotis* (Thomas). Resembling *mohavensis*, but darker. Upperparts grayish brown, tinged with buff to ochraceous buff, with dorsal darkening of black-tipped hairs; paler on head and sides; dusky on "ankles" and hind feet; white on forefeet and toes of hind feet; tail above, brownish black, below, whitish; underparts white, sometimes tinged with buffy on abdomen, where pelage is slate-colored basally. Total length, 14.2 inches; tail vertebræ, 6.8 inches; hind foot, 1.5 inches. Found in "Pacific coast region from Monterey Bay, California, south through the San Pedro Martir Mountains, Lower California. Upper Sonoran and Transition Zones." (Goldman)

Subgenus *Teonoma*

Characterized by large, bushy tail; hind foot densely furred on sole; and by various cranial characters.

Gray Bushy-tailed Wood Rat.—*Neotoma cinerea cinerea* (Ord). Size large; hind feet large and heavily furred from heel to posterior plantar tubercle; ears large; pelage long and thick. Upperparts grayish buff to ochraceous buff, thickly sprinkled with dusky hairs on back; fore- and hind feet white; ears edged faintly with whitish, clothed with brownish and grayish hairs; tail noticeably bushy but flattened, above brownish gray, below white, banded with pale buffy at base; underparts white. Total length, 15.5 inches; tail vertebræ, 6.5 inches; hind foot, 1.7 inches. Found in "Rocky Mountain region in southern British Columbia, Montana, Idaho, western Wyoming, Utah, northern Arizona, and thence westward through the mountains of central Nevada to the southern part of the Sierra Nevada in California. Canadian Zone and down along cold cliffs and canyons well into the Transition Zone." (Goldman) Plate XXXIII.

Nevada Bushy-tailed Wood Rat.—*Neotoma cinerea lucida* Goldman.

Much smaller and paler than typical *cinerea*. Upperparts light buff to light ochraceous-buff, with faint sprinkling of black-tipped hairs; buffy grayish on middle of face, sides of muzzle and outer sides of limbs; tail above grayish, below white; underparts and feet white. Total length, 13.4 inches; tail vertebræ, 5.4 inches; hind foot, 1.6 inches.

Found on Charleston Peak, Charleston Mountains, Clark County Nebraska.

Bushy-tailed Wood Rat.—*Neotoma cinerea drummondi* (Richardson).

Resembling typical *cinerea*, but pelage longer, tail more bushy. Upperparts grayish buff, washed with dusky; dusky on orbital ring; rest of pelage as in typical *cinerea*, except that there is a sharp line of demarcation between



FIG. 83. Bushy-tailed Wood Rat

dark color of forelegs and white feet instead of insensible blending as in *cinerea*. Total length, 15.3 inches; tail vertebræ, 6.7 inches; hind foot, 1.76 inches. Found in "Rocky Mountains of eastern British Columbia and western Alberta, north of the range of *N. cinerea*. Canadian Zone." (Goldman)

Osgood Bushy-tailed Wood Rat.—*Neotoma cinerea saxamans* (Osgood).

Darker in color and tail more bushy than in typical *cinerea*. Upperparts buffy gray darkened everywhere by sprinkling of dusky; feet white; tail above brownish gray for one-third of its length, slaty gray on last two-thirds, below white, banded with buffy gray at base; underparts white. Total length, 16.2 inches; tail vertebræ, 7 inches; hind foot, 1.88 inches. Found in "Northern British Columbia west of the Rocky Mountains, limits of range unknown. Canadian and Hudsonian Zones." (Goldman)

Western Bushy-tailed Wood Rat.—*Neotoma cinerea occidentalis* (Baird).

Resembling typical *cinerea*, but darker in color, "ankles" more dusky. Upperparts brownish buff, heavily sprinkled with dusky; head and sides with less dusky than back; ears brownish, whitish along edge; fore- and hind feet white; forearms brownish buff in marked contrast to white feet; "ankles" dusky; tail above brownish black grizzled with gray, below white, banded with buffy at base; underparts dull white, ochraceous buff under forelegs. Total length, 16 inches; tail vertebræ, 7 inches; hind foot, 1.6 inches. Found "From Pacific coast region of southwestern British Columbia to northern California (except the narrow coastal strip west of the Cascade Mountains in Oregon), and thence eastward over the lava beds to south-central Idaho and northeastern Nevada. Mainly Transition and Canadian Zones." (Goldman)

Fuscos Bushy-tailed Wood Rat.—*Neotoma cinerea fusca* (True).

Resembling typical *cinerea*, but darker, pelage more woolly, ears smaller, and tail without white on under surface. Upperparts mixed grayish tawny and black, the black predominating along back; head and sides with less black; dusky on muzzle, ears (which are faintly edged with whitish), upperpart of hind feet and "ankles"; tail above, blackish, below, buffy gray, washed with blackish; underparts whitish, pure white to roots on breast and inguinal region, washed with grayish tawny on inner sides of legs, and with tawny ochraceous on throat. Total length, 16 inches; tail vertebræ, 7.4 inches; hind foot, 1.8 inches. Found in "Humid coastal belt west of the Cascade Mountains in Oregon. Transition Zone." (Goldman)

Colorado Bushy-tailed Wood Rat.—*Neotoma cinerea orolestes* (Merriam).

More ochraceous than typical *cinerea*. Upperparts ochraceous buff, sprinkled with blackish on back; sides brighter than back; feet white; tail above grayish buff for one-third of length, brownish buff for last two-thirds, below white, banded at base with pale buffy; underparts white, pelage white to base on breast and inguinal region. Total length, 16 inches; tail vertebræ, 7 inches; hind foot, 1.6 inches. Found in "Rocky Mountain region from northern New Mexico north through Colorado and Wyoming to southern Montana and thence eastward to the Black Hills in South Dakota. Mainly Transition and Canadian Zones." (Goldman)

Arizona Bushy-tailed Wood Rat.—*Neotoma cinerea arizonæ* (Merriam).

Resembling typical *cinerea*, but smaller, tail less bushy, color brighter. Upperparts ochraceous buff, thinly sprinkled with dusky; sides brighter than back; feet white; tail

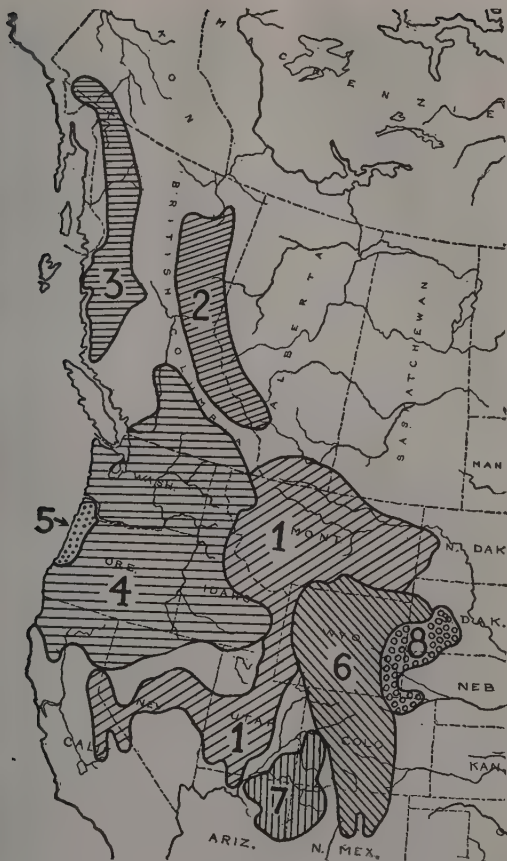


FIG. 84. Distribution of the subspecies of *Neotoma cinerea*, after Goldman

1. *Neotoma cinerea cinerea*
2. *Neotoma cinerea drummondi*
3. *Neotoma cinerea saxamans*
4. *Neotoma cinerea occidentalis*

5. *Neotoma cinerea fusca*
6. *Neotoma cinerea orolestes*
7. *Neotoma cinerea arizonæ*
8. *Neotoma cinerea rupicola*

above, grayish brown, below, white; underparts white. Total length, 14 inches; tail vertebræ, 6 inches; hind foot, 1.44 inches. Found in "Upper Sonoran Zone in north-eastern Arizona, southeastern Utah, and probably northward along the Green River Valley, southwestern Colorado, and northwestern New Mexico." (Goldman)

Pale Bushy-tailed Wood Rat.—*Neotoma cinerea rupicola* (Allen).

Similar to typical *cinerea*, but smaller, tail shorter, and color paler. Upperparts cream-buff, sprinkled moderately with blackish; tail above, brownish gray, lighter at tip, below, white; feet clear white; underparts pure white. Total length, 14 inches; tail vertebræ, 5.8 inches; hind foot, 1.7 inches. Found in "Big Bad Lands region from southwestern South Dakota, through southeastern Wyoming and western Nebraska to northeastern Colorado. Upper Sonoran Zone." (Goldman)

* * * * *

The Wood Rat is found only in the Western Hemisphere and here its range is restricted to North and Middle America, with by far the greater number of species occurring in the western half of the continent. Wood Rats are easily distinguished from other rodents by their size and rat-like form, the only species liable to be confused with them being the two introduced Rats,—the Norway Rat and the Roof Rat. Aside from important dental and cranial characters, the introduced Rats differ from the Wood Rats in the details set forth in the discussion on page 452.

Over much of the western range of the genus the Wood Rat is a common rodent. The round-tailed species are essentially mammals of the lower life zones, found on plains, deserts, and in brushy areas of the more open forests; the bushy-tailed species are forest dwellers, found in the Rocky Mountains and adjacent ranges and in the higher life zones. In the eastern United States, the only species found as far north as New York is *pennsylvanica*, rare and local in distribution. In the southeastern states, the forms of the *floridana* group are found. From the Great Plains westward the genus is represented by many forms and nearly every peculiar environment has its own distinct race.

In many places these Rats build large conspicuous nests of dead twigs, leaves, and debris of various sorts, this habit being especially obvious in the deserts and arid plains. In regions of cactus growth the spiny cactus lobes are placed on the nest

and the nest itself may be built about one of these thorny plants. Wood Rats have a very inquisitive disposition and seem possessed of a collecting instinct. Small objects of metal especially attract them and the Rats bear off to their nests anything of this sort that is left lying about a camp. Coins, small traps, belt buckles, nails, and any bright object within their powers of transportation will be carried away by these visitors, and in the morning the articles can usually be found piled on a nearby nest.

The Bushy-tailed Wood Rats generally live in rocks or cliffs and do not build large and conspicuous nests in the open. Piles of debris may be seen in crevices in the rocks, but the animals count more upon a retreat back of the rocks themselves. These species have the mania for collecting, however, and it is not always so easy to find what they have carried off, since it may be hidden in some out-of-the-way crevice. The name Trade Rat is especially apt for these creatures because they frequently bring some object to place on the spot where they have stolen something. I have known Trade Rats to carry off rivets from the blacksmith shop of a mining camp and fill up the box where they got the rivets with pebbles and other objects gathered up outside the shop. Perhaps in the eyes of the Rat this was a fair exchange and no robbery.

Although never becoming a house Rat to the extent that the introduced Rats have become, Wood Rats sometimes leave their native abodes and take up quarters in barns, ranch-houses, and miners' cabins. Under such circumstances they become a nuisance, chiefly because of the noise they make at night and because of the articles they carry off. They are not as destructive as the domestic Rats, however, although, of course, they eat grain or whatever food of a similar nature they have access to. The bushy-tailed, mountain species make a noise at night out of all proportion to their size, running over rafters, thumping on the floor, rattling the kindling in the wood-box, or romping with care-free abandon. They are apt to be bold rather than timid, and sit blinking at a light instead of running for cover like a Norway Rat when their midnight frolic is interrupted.

Wood Rats are attractive creatures, with rather large eyes and soft fur, and little of the slinking, furtive appearance of the introduced Rats. As pets they soon become friendly and

are gentle and easily cared for. They are cleanly in habits and, as far as I am aware, are not carriers of disease. While most active after sundown, they are not infrequently seen during the daytime and are curious enough to come out and investigate any unusual disturbance. Wood Rats are active throughout the year and do not hibernate.

In the northern part of their range, Wood Rats raise but one brood of young a year, but in the regions of mild winters several litters a year is more the rule. These litters contain from three to six individuals.

The pelage of the Wood Rat is quite soft, but it is of no commercial value as fur; at least no market for it has yet been established. The flesh of these Rats is white and palatable, being eaten by some of the western Indians, but because the animal bears the name of Rat it is not apt to become a common article of diet with most people.

Subfamily **Microtinæ**. Voles and Lemmings

Cricetine rodents with flat-crowned molars; molar pattern prismatic, composed of angular figures; habit terrestrial, fossorial, or semiaquatic.

Genus **Synaptomys**¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Lemming Mouse.—Synaptomys cooperi

and related forms

Names.—Lemming Mouse; Bog Mouse; Bog Lemming.

General Description.—Externally very much like a small, short-tailed Meadow Mouse, but differing in cranial and dental characters. Form thickset; tail very short; pelage coarse; incisors orange; upper incisors with longitudinal groove; rostrum very short; molars rootless; nail of first digit of forefoot flat and strap-shaped; plantar tubercles six; dwelling in bogs and swamps. Plate XXX.

Color.—Sexes colored alike; seasonal variation not very great.

¹ For a full revision of this genus see A. B. Howell, *North American Fauna*, No. 50. 1927.

Upperparts mixed gray, yellowish brown and black, giving a grizzled appearance similar to cinnamon-brown; tail bicolor, above brownish, below whitish; underparts soiled whitish wash over slate-colored underfur.

Immature pelage darker and more slaty than adult.

Measurements.—Sexes of equal size. Total length, 4.8 inches; tail vertebræ, .7 inch; hind foot, .72 inch.

Geographical Distribution.—Boreal North America.

Food.—Vegetation, see page 398.

Enemies.—Snakes, Hawks, Owls, Weasels, Foxes, and other small carnivores.

Species and Subspecies of the Genus *Synaptomys*

Subgenus *Synaptomys*

Cooper Lemming Mouse.—*Synaptomys cooperi cooperi* Baird.
As described above. Found in the cooler zones, in favored localities, from Minnesota to the Atlantic and south through New York and Michigan.

Synaptomys fatuus Bangs = *Synaptomys cooperi cooperi*.

Stone Lemming Mouse.—*Synaptomys cooperi stonei* Rhoads.
Closely related to typical *cooperi* and intermediate between it and *helaletes* in size of rostrum; incisors wide (1.7 mm.); color about as in typical *cooperi*. Total length, 5.1 inches; tail vertebræ, .8 inch; hind foot, .8 inch. Found in "Lower portion of Transition and northern half of the Upper Austral Zones in the United States east of the Plains, from central Wisconsin and Illinois east to the Atlantic coast; occurs as far north as Massachusetts and south in the mountains into North Carolina." (Howell)

Virginia Lemming Mouse.—*Synaptomys cooperi helaletes* (Merriam).

Resembling *cooperi*, but with larger head and feet and longer tail; incisors very broad (1.9 mm.); color very much as in *cooperi*. Total length, 5.2 inches; tail vertebræ, .85 inch; hind foot, .8 inch. Found in "Extreme southeastern Virginia and northeastern North Carolina." (Howell)

Goss Lemming Mouse.—*Synaptomys cooperi gossii* (Coues).
Somewhat redder in color than *helaletes* which it resembles; skull long and heavy; rostrum wide. Total length, 5.4 inches; tail vertebræ, .8 inch; hind foot, .8 inch. Found in "The west-central Mississippi Valley country, mostly in the Upper Austral Zone, from northeastern Arkansas and southern Illinois into Iowa and extreme southeastern South Dakota." (Howell)

Subgenus *Mictomys*

Distinguished from the subgenus *Synaptomys* by cranial and dental characters.

Richardson Lemming Mouse.—*Synaptomys borealis* (Richardson)

"A dark, richly colored race, with foot somewhat short. Skull rather small, . . . dorsal coloration rich and dark. . . . Argus brown . . . plentifully mixed with black-tipped hairs. . . . The tail is distinctly bicolor. . . . Total length, 5.2 inches; tail vertebræ, 1 inch; hind foot, .72 inch." (Howell) Found in "The Athabaska-Mackenzie region of Canada from Great Bear Lake south to near Edmonton, and eastward (provisionally) to Lake Winnipeg." (Howell)

Dall Lemming Mouse.—*Synaptomys borealis dalli* (Merriam).

"A rather bright-colored race, with skull of moderate size." Upperparts Brussels brown mixed with blackish. Total length, 5.2 inches; tail vertebræ, .8 inch; hind foot, .8 inch. Found in "Hudsonian Zone in Alaska and south to central British Columbia to the eastward of the coast district." (Howell)

Synaptomys andersoni Allen is said by Howell to be indistinguishable from *dalli*.

Chapman Lemming Mouse.—*Synaptomys borealis chapmani* (Allen).

"A dark but dull-colored race with but slight dorsal tinge of chestnut. Incisive foramina and rostrum long." Color dull and gray, with some brown on rump; tail faintly bicolor. Total length, 5.2 inches; tail vertebræ, 1 inch; hind foot, .72 inch. Found in "Evidently the Canadian Zone of the eastern portion of the southern half of British Columbia, and adjacent mountainous slopes in extreme western Alberta." (Howell)

Wrangell Lemming Mouse.—*Synaptomys borealis wrangeli* (Merriam).

"A race that is quite variable in coloration, with very low, flat brain case, rather slender rostrum. . . . In coloration, ranging from skins that are a perfect match for the brightest, brownest *dalli*, to others that can not be told from gray and grizzled specimens of *chapmani*, but the warmer tone of color seems to be somewhat the more prevalent and to be more typical of the unworn condition of pelage." Total length, 5.3 inches; tail vertebræ, 1 inch; hind foot, .64 inch. Found in "Coastal strip in the Canadian Zone from the Alexander Archipelago southward to the northern border of the United States." (Howell)

Synaptomys truei Merriam is considered by Howell to be indistinguishable from *wrangeli*.

LEMMING MOUSE

Ungava Lemming Mouse.—*Synaptomys borealis innuitus* (True).

"Skull very small and flat, with short and narrow rostrum. Color.—Not dependable, as the type has been in alcohol ever since collected (1884). Known only from Fort Chimo," Ungava, Canada. (Howell)

Labrador Lemming Mouse.—*Synaptomys borealis medioximus* (Bangs).

"Coloration bright. The skull is intermediate in size between those of *innuitus* and *sphagnicola*. The type, in very full pelage, is quite bright dorsally. Anteriorly the coloration is slightly darker, because, in large measure, of the more plentiful admixture of black-tipped hairs. Feet and tail dark, the latter scarcely bicolor. Underparts, without buff." Total length, 4.8 inches; tail vertebræ, .88 inch; hind foot, .84 inch. "Known only from the coast district of southern Labrador." (Howell)

Preble Lemming Mouse.—*Synaptomys borealis sphagnicola* (Preble).

"A race with large, well-ridged skull, long rostrum, . . . Dorsal coloration close to the Prout brown of Ridgway, which is most intense upon the rump; anteriorly duller, grayer, and more grizzled. Tail, distinctly bicolor." Total length, 5.3 inches; tail vertebræ, 1 inch; hind foot, .8 inch. Found in "Canadian Zone in the northern New England States from the type locality north to include New Brunswick and the portion of Quebec east and south of the St. Lawrence River." (Howell)

* * * * *

"*Synaptomys* is not common in collections, but it is by no means certain that it is not more numerous in nature than is generally supposed. Except in a very few places, or in years of unusual abundance, lemming mice have proved exceedingly difficult to obtain in numbers. Because they are usually confined to bogs and tracts of swampy land, they are rarely if ever of economic importance.

"The habits of lemming mice are almost unknown. The members of the genus *Synaptomys* belong at the present day definitely to a boreal fauna, and in the north, although usually found in moist situations, they also occur in dry patches of grass and other low cover, as well as in bogs. In the districts farther south, however, they have evidently been able to survive only because of the presence of occasional cold sphagnum bogs, to which they are almost entirely confined in the lower latitudes of the Eastern States. Near Lake Drummond, Va., however, and at Horseshoe Lake, Mo., in Indiana,

and at several other places the genus has been found in grass-land, both moist and dry.

"Observations on food habits have been confined practically to the recording of the presence of cut green grasses in the runways, but judging from the habits of related rodents, these animals may occasionally feed upon a variety of bulbs and even insects, as well as succulent herbage. Examination in the Biological Survey of 11 stomachs from Kansas and 1 from Minnesota also showed contents of finely ground grass and sedge leaves and a few insignificant traces of other green vegetation. Further observations on the food habits of *Synaptomys* are greatly needed.

"Well-defined runways are maintained, and burrows are constructed in the ground or through beds of sphagnum. Nests are occasionally placed in tussocks of grass or amid other surface cover, according to published reports.

"Collectors, mostly those of the Bureau of Biological Survey, have trapped females containing from four to six embryos, from March 11 to October 7. This indicates that litters are only of moderate size. Probably several litters are borne each year, the period of greatest reproductive activity being largely confined to the warmer months.

"Lemming mice are so rarely obtained that collectors are likely to seek them whenever possible. Further material from certain critical localities is badly needed, however, and it is hoped that field parties will make special efforts to procure such desiderata. Until more specimens are obtained further progress in the proper understanding of the relationships of several races can hardly be expected." (Howell)

Genus *Lemmus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{2}{3}$ = 16.

Lemming.—*Lemmus trimucronatus*

and related forms

Names.—Lemming; Brown Lemming; Back Lemming.

General Description.—A small, thickset rodent with much the appearance of a large, short-tailed Meadow Mouse. Soles of feet hairy, without well-developed tubercles; forefeet large and strong, with well-developed claws, thumb much

reduced, with long, flat, nail-like claw; upper incisors without grooves; ears small, hidden in long pelage of head and neck; pelage long and lax; tail very short, well haired. Plate XXX.

Color.—Sexes colored alike; seasonal variation not conspicuous as in the Lemmings of the genus *Dicrostonyx*.

Upperparts.—Head and shoulders to middle back grizzled buffy, slaty black and grayish; lower back and rump rusty



FIG. 85. Lemming

red or rufous; sides light ochraceous; tail above, yellowish brown, below, slightly lighter; feet dusky; pelage everywhere slate-colored at base.

Underparts.—Light ochraceous with slate-colored basal pelage showing through.

Immature more unicolor than adults, yellowish brown.

Measurements.—Sexes of equal size. Total length, 6 inches; tail vertebræ, .8 inch; hind foot, .8 inch.

Geographical Distribution.—Arctic North America and south along Rocky Mountains to western Alberta.

Food.—Grasses, foliage of Arctic plants, mosses, lichens, etc.

Enemies.—Owls, Hawks, Weasels, Arctic Foxes, and other predatory mammals.

Species of the genus *Lemmus***American Lemming; Back Lemming.**—*Lemmus trimucronatus* (Richardson).

As described. Found on the Melville Peninsula, Booth Peninsula, northern shores of Hudson Bay, and adjacent territory; west to Great Bear Lake and Anderson River; limits of range unknown. Named Back Lemming for Capt. Back.

Tawny Lemming.—*Lemmus helvolus* (Richardson).

Yellower and more tawny than *trimucronatus* which it equals in size. Upperparts yellowish brown, grizzled with gray and dusky on head and shoulders. Found in alpine swamps and meadows of Rocky Mountain district about the headwaters of the southern Peace River, Alberta; has been recorded from Telegraph Creek, British Columbia; limits of range unknown.

Point Barrow Lemming.—*Lemmus alascensis* Merriam.

In coloration somewhat intermediate between *trimucronatus* and *helvolus*. Upperparts warm yellowish brown with tendency toward rusty on the rump; head and shoulders grizzled buffy, grayish, and blackish. In winter the pelage is more fulvous and with less ochraceous tinge. Total length, 6.2 inches; tail vertebræ, .9 inch; hind foot, .83 inch. Found in Alaska, from Point Barrow south; limits of range unknown.

Yukon Lemming.—*Lemmus yukonensis* Merriam.

"Size small, ears relatively large; general color dark anteriorly, with bright fulvous or rufous rump and flanks; audital bullæ immense." (Merriam) Total length, 5.2 inches; tail vertebræ, .7 inch; hind foot, .8 inch. Found in Alaska in the region of Charlie Creek, Yukon River.

Osgood Lemming.—*Lemmus minusculus* Osgood.

Like *alascensis*, but smaller and with less difference between color of head and shoulders as compared with rump. Upperparts ochraceous mixed with blackish; rump hazel to chestnut; sides and underparts clear ochraceous. Total length, 5.2 inches; tail vertebræ, .5 inch; hind foot, .75 inch. Found in the region of the Upper Nushagak River drainage, base of Alaska Peninsula.

Black-footed Lemming.—*Lemmus nigripes* (True).

Cinnamon-gray above; sides clear tawny brown; underparts paler tawny; black on nose, upperside of forefeet, upper and lower sides of hind feet and upperside of tail. Total length, 5.8 inches; tail vertebræ, .5 inch; hind foot, .8 inch. Found on St. George Island, Pribilof Islands, Alaska.

Preble, in *North American Fauna*, No 22, page 54, gives the following account of habits, writing of *trimucronatus*.

"We found this fine species at but one locality, near the

mouth of Thlewiaza River, where it was common and where a series of about seventy, comprising adults and young of both sexes, was secured August 4 to 8. A succession of low, flat, boulder-covered areas, which lay between the shore and some shallow lagoons a few hundred yards inland, was occupied by the animals. The ground was dry and well covered with short, thick grass, through which their runways extended in every direction. They burrowed extensively, sometimes beneath boulders, but as often in the sides of tiny terraces or from a flat surface. Their holes seemed to be connected in an endless labyrinth. We captured several by suddenly overturning some of the boulders, but most were taken in traps set in their well-trodden roads. They paid no attention to bait, but were readily caught in runway traps. When taken alive they showed considerable ferocity for animals of their size, snarling and biting vigorously. The breeding season seemed to be nearly over, but a few females contained from four to six embryos. The teats are eight in number, four inguinal and four pectoral."

The migrations of Lemmings are one of the marvels of rodent life. These great movements of Mice have been well known in northern Europe from early times, and similar activity has been noted in Arctic America. When conditions have been unusually favorable for the Lemmings and the normal checks on the annual increase have been unable to keep down the numbers of the Mice, the Lemming population becomes too vast for the available food supply. Great swarms of Lemmings start for new territory and move in vast waves of rodent life which do not stop for rivers, lakes, or any obstacle of topography. These hordes are followed by the natural enemies of the Mice, Hawks, Owls, Foxes, etc., and through the constant attacks of these and the inroads of disease and accident, the multitudes gradually melt away. After such a migration the numbers of Lemmings may be very low until the recuperative powers of the species have brought the cycle onto the upturn once more.

Genus *Dicrostonyx*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

¹ For a full revision of this genus see G. M. Allen, Bulletin Museum of Comparative Zoology, Vol. LXII, pp. 509-540, 1919.

Collared Lemming.—*Dicrostonyx hudsonius*

and related forms

Names.—Collared Lemming; Snow Lemming; Pied Lemming.

General Description.—A stout-bodied Mouse, related to the Meadow Mice, with large third and fourth claw on forefoot (abnormally large in winter); small ears; short tail; very small thumb; pelage white in winter, long and soft.

Color.—Sexes colored alike; marked seasonal variation.

Upperparts (summer) buffy gray to almost clear gray produced by mixture of gray, buffy gray, and black; a median

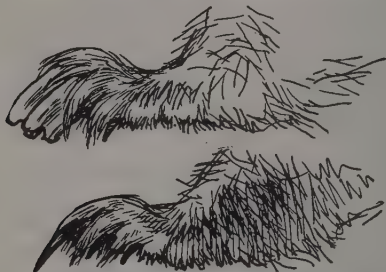


FIG. 86. Forefoot of Collared Lemming
Upper figure foot in winter,
lower figure foot in summer

black line from forehead to tail not sharply marked off from surrounding pelage; ears tufted with tawny, enclosed by indistinct grayish patch; buffy on sides of nose and about eye; tail like rest of upperparts; collar formed by tawny band from armpits across throat; underparts washed with pale tawny.

Winter pelage, everywhere white, hairs slaty at base.

Immature pelage (summer) like adults but darker, collar less distinct.

Measurements.—Sexes of equal size. Total length, 6 inches; tail vertebræ .8 inch; hind foot, .88 inch.

Geographical Distribution.—Arctic America.

Food.—Vegetation.

Enemies.—Hawks, Owls, Ravens, Weasels, Foxes, Lynxes, Wolverines.

Species and Subspecies of the Genus **Dicrostonyx**.

Subgenus **Dicrostonyx**

Labrador Collared Lemming.—*Dicrostonyx hudsonius* (Pallas).
As described above. "This species is confined, so far as known, to the barren-ground area of the Labrador Peninsula, from (probably) the Straits of Belle Isle on the south-east to about the latitude of Great Whale River (55° N.) on the west side. It is also found on some of the small islands along the eastern side of Hudson Bay, but on the west side of the bay its place is taken by *D. r. richardsoni*." (G. M. Allen)

Subgenus **Misothermus**

Alaskan Collared Lemming.—*Dicrostonyx rubricatus rubricatus* (Richardson).

Brighter colored than *hudsonius*. Upperparts (summer) chestnut, grizzled with white; lower back grizzled whitish and blackish; nose to nape black and continuous as a narrow, black, median stripe to base of tail; ears tufted with rusty; hips grayish; feet and tail whitish; underparts washed with orange buff or (less frequently) whitish. Winter pelage white. Total length, 6.1 inches; tail vertebræ, .76 inch; hind foot, .80 inch. Found on "the barrens of northern Alaska, including the peninsula and eastward along the Arctic coast of Mackenzie to Coronation Gulf." (G. M. Allen)

Richardson Collared Lemming.—*Dicrostonyx rubricatus richardsoni* (Merriam).

Without such a bright and contrasted color pattern as typical *rubricatus*. Upperparts (summer) varying from ruddy gray to brownish; buff-yellow on sides of nose and flanks; grizzled black and buffy from nose to tail; tawny on ears and on shoulders; feet and tip of tail whitish, washed with buffy; underparts washed with pale cinnamon-buff; band across throat tawny. Winter pelage white. Total length, 5.8 inches; tail vertebræ, .56 inch; hind foot, .78 inch. Found in Barren Grounds from Fort Churchill, Hudson Bay to Aylmer Lake, western Keewatin and Artillery Lake, eastern Mackenzie and north almost to Coronation Gulf on the Arctic coast.

Unalaska Collared Lemming.—*Dicrostonyx rubricatus unalasensis* (Merriam).

"Closely related to *rubricatus* from which it differs in its relatively longer and more slender rostrum, its weaker, less broadly rounded zygomata, and slightly more protruding

incisors. External characters unknown. . . . Confined, so far as known, to the island of Unalaska, Alaska Peninsula." (G. M. Allen)

St. Lawrence Island Lemming.—*Dicrostonyx exsul* G. M. Allen

Resembling *rubricatus* but grayer in color. Upperparts (summer) pinkish gray; gray on nose and cheeks; sprinkling of black hairs on nose, on cheeks, and along median line of back; ochraceous buff mixed with tawny about ear; sides brighter than back; feet pale buff; tail whitish; underparts washed with ochraceous buff, chin and undersides of forelegs pure white, throat tinged with tawny. Winter pelage white. Total length, 5.8 inches; tail vertebræ, .68 inch; hind foot, .80 inch. Found only on St. Lawrence Island, Bering Sea, Alaska.

Greenland Collared Lemming.—*Dicrostonyx grænlændicus* (Traill).

Most like *rubricatus* but much smaller and differing in various cranial characters. Upperparts (summer) grizzled blackish and gray; neck and shoulders washed with ochraceous orange; narrow black median stripe from nose to shoulders; feet and tail white tinged with buffy; underparts washed with ochraceous orange. Winter pelage white. Total length, 4.3 inches; tail vertebræ, .35 inch; hind foot, .60 inch. Found "from about latitude 69° N. on the east coast of Greenland, northward to the limit of land, 83° 24', and thence westward along the coast of North Greenland to the Kane Basin, and across the Robeson Channel to Grinnell Land, Ellesmere Land, and south to Baffin Land." (G. M. Allen)

* * * * *

The Collared Lemmings are the only Mice which change color from summer to winter pelage. In summer they look like short-tailed Meadow Mice, brownish or grayish in color, but when winter comes a pure white pelage appears and with it the greatly enlarged claws on the front feet. By the single character of the specialized claws, winter specimens of the genus *Dicrostonyx* may be easily distinguished.

This genus is Arctic and Subarctic in its distribution and is usually found on the barren, open areas. These Mice make burrows and have underground nest chambers which are lined with grass and moss. In winter they make many runways under the surface of the snow, but in summer there are very few surface runways such as are made by Meadow Mice. Collared Lemmings are chiefly nocturnal in habit.

These Mice sometimes become so abundant that they are observed in a great migration similar to that of the Lemmings

of the genus *Lemmus*, although this is of comparatively rare occurrence since *Dicrostonyx* is usually not as abundant as *Lemmus*. At such times *Dicrostonyx* swim streams and press on in the face of all obstacles.

The young are born in early summer and usually number three to a litter.

Genus *Phenacomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Phenacomys.—*Phenacomys intermedius*

and related forms

Names.—*Phenacomys*; Lemming Mouse. For want of a good colloquial or vernacular name for the members of the genus, Howell suggests the generic term as the common group name. The two arboreal species are called Tree Mice.

General Description.—A small Mouse very similar in external appearance to some of the Meadow Mice from which it may be certainly distinguished only by cranial and dental characters (rooted molars as compared to unrooted molars in *Microtus*). Form normal and mouse-like; legs short; tail short (long in some forms of the genus), pelage rather long and loose; ears rather small and almost hidden in fur of head; mammæ eight in number; plantar tubercles six (as far as known); a rare Mouse in most localities. Plate XXX.

Color.—Sexes colored alike; some seasonal variation, but little is known on this point.

Upperparts.—Color variable, from tawny olive to umber, pelage slate-colored at base and showing through to some extent. In winter grayer. Tail bicolor.

Underparts.—Whitish, sometimes with buffy wash.

Immature pelage darker than adult.

Measurements.—Sexes of approximately equal size. Total length, 5.7 inches; tail vertebrae, 1.2 inches; hind foot, .7 inch.

Geographical Distribution.—Found in the colder zones and mountain summits of Canada and the western United States.

Food.—Vegetation, seeds, stems, soft parts of plants; in case of two species, needles of conifers.

¹ For a recent and comprehensive revision of this genus see A.B. Howell; *North American Fauna*, No. 48, 1926.

Enemies.—Very little is known of the life-history of this genus, but undoubtedly it has the same enemies as Meadow Mice, namely, Snakes, Hawks, Owls, and small carnivores. The Blue Jay is said to prey on the young of the two arboreal species of *Phenacomys*.

Species and Subspecies of the Genus *Phenacomys*

Intermedius Group

Characterized by short tail, and face without distinct yellow wash; found in mountains of the West.

Rocky Mountain *Phenacomys*.—*Phenacomys intermedius intermedius* Merriam. Plate XXX.

As described above. Found in "British Columbia west of the eastern divide of the Rocky Mountains, northeastern Washington, Idaho, eastern and southern Oregon, and northern California; thence in the mountains through southern Montana, Wyoming, Colorado, and into northern New Mexico." (Howell) *Phenacomys orophilus* Merriam, *P. preblei* Merriam, and *P. constablei* Allen are all synonyms of *P. i. intermedius*.

Alberta *Phenacomys*.—*Phenacomys intermedius levis* A. B. Howell.

Resembling typical *intermedius* but skull smaller and weaker. Pelage of upperparts drab at base, tipped with brown, feet pure white; tail faintly bicolor; underparts grayish, sometimes tinged with buffy. Total length, 5.5 inches; tail vertebrae, 1.3 inches; hind foot, .7 inch. Found "Upon the eastern slope of the Rocky Mountains at least from central Alberta south to Teton County, Mont." (Howell).

Olympic *Phenacomys*.—*Phenacomys intermedius olympicus* (Elliot).

Darkest of the short-tailed forms of the genus. Upperparts dark drab; underparts clear gray; feet white; tail bicolored. Total length, 6.2 inches; tail vertebrae, 1.7 inches; hind foot, .8 inch. Found "In the Hudsonian Zone of the Olympic and Cascade Mountains of Washington, and as far south as central Oregon." (Howell)

Sierran *Phenacomys*.—*Phenacomys intermedius celsus* A. B. Howell.

Very pale, slightly smaller than *olympicus*. Upperparts wood-brown; tail bicolor; underparts whitish, tinged usually with buffy. Total length, 5.9 inches; tail vertebrae, 1.6 inches; hind foot, .72 inch. Found in "The Sierra Nevada of California from the Lake Tahoe region south probably as far as Tulare County." (Howell)

Quebec, including Ungava, and at least as far west as central Ontario." (Howell)

Phenacomys latimanus Merriam = *Phenacomys ungava ungava*.

Labrador Phenacomys.—*Phenacomys ungava crassus* (Bangs)
Large and dull-colored. Upperparts snuff-brown; underparts grayish; tail bicolor; nose yellowish. Total length, 6.1 inches; tail vertebræ, 1.5 inches; hind foot, .8 inch. Found in "Southern Labrador: Limits of range unknown." (Howell)

Mackenzie Phenacomys.—*Phenacomys mackenzii* Preble.
Rather small, tail short, feet small. Upperparts brown, darkest on rump, grayer on foreparts; face yellowish; feet pale; tail bicolor; underparts grayish white. Total length, 5.6 inches; tail vertebræ, 1.3 inches; hind foot, .68 inch. Found in "The territory east of the mountains in Alberta, north almost to Great Bear Lake, and east to Hudson Bay." (Howell)

Albipes Group

Characterized by long tail (slightly hairy) and sooty nose; found along Pacific coast of northern California to Oregon.

Coast Phenacomys.—*Phenacomys albipes* Merriam.

Dark rich brown in color, tail long. Upperparts rich warm brown, mixed with black-tipped hairs, brownest member of the genus; tail bicolor; face sooty; feet light; underparts clear gray, in fall pelage with buffy tinge. Total length, 6.8 inches; tail vertebræ, 2.5 inches; hind foot, .78 inch. "Occurs in a coastal strip of unknown width from Arcata, Humboldt County, Calif., north to the vicinity of the Columbia River probably, and east as far as Vida, Oregon." (Howell)

Longicaudus Group

Characterized by arboreal habit and long, heavy tail, somewhat hairy; found in humid coastal forests of northern California and Oregon.

Red Tree Mouse.—*Phenacomys longicaudus* True.

Rather large in size; tail long, somewhat hairy; toes long; color bright reddish. Upperparts uniform cinnamon, with a few black-tipped hairs; sides slightly paler; tail blackish; ears and feet colored like upperparts; underparts whitish. Females slightly larger than males. Total length, males, 6.6 inches, females, 7.3 inches; tail vertebræ, males, 2.7 inches, females, 2.9 inches; hind foot, males, .8 inch, females, .84 inch. Found "Locally in humid coast district from Mendocino County, Calif., into central Oregon, and possibly to the Columbia River." (Howell)

Forest Tree Mouse.—*Phenacomys silvicola* A. B. Howell.

Resembling *longicaudus* in characters of long tail and toes, but nose sooty and color warm brown. Upperparts cinnamon-brown, with some black-tipped hairs; sides slightly paler; tail blackish; underparts whitish. Total length, 7.7 inches; tail vertebræ, 3.5 inches; hind foot, .84 inch. "Known only from the type locality, [Tillamook, Oregon] and from Corvallis, Oreg.; undoubtedly confined to the forested area of the humid coast belt." (Howell)

* * * * * * *

The members of the genus *Phenacomys* are rare in collections and comparatively little is known of their life-histories. The group is confined to North America, and although it has rather a wide geographic distribution and has been eagerly sought by collectors, only a few specimens have been taken in the thirty-seven years that *Phenacomys* has been known.

These Mice frequent various habitats and have different habits accordingly. Some forms, such as the *intermedius* group, live in open, grassy parks in the forest, or in patches of leather or moss; *albipes* haunts borders of small streams in humid forests; while *longicaudus* and *silvicola* are arboreal and have well-made nests in coniferous trees. The terrestrial forms sometimes make well-defined runways, when the cover is dense, similar to those of Meadow Mice.

The nests of *longicaudus* are large affairs made of the needles and twigs of the fir (Douglas and Grand Firs), four to ten inches deep and a foot or more in diameter. The average height from the ground is about thirty feet and there is evidence to indicate that perhaps it is mostly the females which have an arboreal existence and that the males may be almost entirely terrestrial in habit. Also there is reason to believe that the Tree Mouse is rather more plentiful in its chosen habitat than its scarcity in collections would indicate.

The terrestrial forms of *Phenacomys* are very easily confused with the small species of Meadow Mice. There are no good field characters to afford a quick and certain identification of these mammals and about the only safe way to proceed is to suspect all small, short-tailed Moles which are caught in territory known to be inhabited by the genus. Specimens of this rare genus are very desirable for museum collections, and any large museum will be glad to identify these specimens for the sake of adding to our knowledge of the group.

Howell believes that more than one litter of young is raised annually and gives the number in a litter as from four to nine, the usual number being five or six (for *longicaudus* one to three). None of these Mice hibernate and it is unlikely that any of them are of any economic importance, since most of the species do not come into conflict with agricultural interests.

Genus *Evotomys*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Red-backed Mouse.—*Evotomys gapperi*

and related forms

Names.—Red-backed Mouse; Red-backed Vole. Plate XXX.

General Description.—A small to medium-sized Mouse with small eyes; low ears, just reaching above fur; short tail; pelage rather long and usually characterized by a broad, reddish dorsal band; habitat cool forests and brushy areas.

Color.—Sexes colored alike, a slight seasonal variation.

Upperparts.—Winter: dorsal band from crown to base of tail bright chestnut, sprinkled with black; sides buffy ochraceous; feet clear gray; tail bicolor, brownish above, black-tipped, grayish buff below.

Underparts.—Pale buff.

Summer pelage slightly darker.

Immature pelage with less bright tones and more subdued coloration.

Measurements.—Sexes of equal size. Total length, 5.6 inches; tail vertebræ, 1.5 inches; hind foot, .72 inch.

Geographical Distribution.—Northern portions of wooded North America.

Food.—Green vegetation and seeds, stems, leaves, and soft parts of grass and low-growing plants.

Enemies.—Snakes, Hawks, Owls, Weasels, Foxes, Skunks, and most small carnivores.

¹The only revision of this genus now available is by Vernon Bailey. Proceedings Biological Survey Washington, Vol. XI, pp. 113-138, 1897. Some forms have been described since then and the ranges are not very well known.

RED-BACKED MOUSE

Species and Subspecies of the Genus *Evotomys*.

Gapper Red-backed Mouse.—*Evotomys gapperi gapperi* (Vigors).

As just described. Found "From Massachusetts, New Jersey, and Pennsylvania northward and from the Atlantic coast westward to the Rocky Mountains in Canada." (Bailey)

White Mountain Red-backed Mouse.—*Evotomys gapperi ochraceus* Miller.

Slightly larger than typical *gapperi*, duller and paler. Dorsal area poorly defined, dull rusty rufous; sides buffy clay color. Total length, 6 inches; tail vertebræ, 1.6 inches; hind foot, .76 inch. Found in "The White Mountains of New Hampshire and (probably eastward to) Nova Scotia." (Bailey)

Rhoads Red-backed Mouse.—*Evotomys gapperi rhoadsi* Stone.

Resembling typical *gapperi* but dorsal stripe slightly darker. Upperparts chestnut; sides buffy gray. Total length, 5.6 inches; tail vertebræ, 1.5 inches; hind foot, .8 inch. Found in region about Mays Landing, Atlantic County, New Jersey; limits of range unknown.

Loring Red-backed Mouse.—*Evotomys gapperi loringi* Bailey.

Size small, color bright. Upperparts (winter) pale reddish hazel; sides ashy; feet and underparts white; tail bicolor, blackish brown and whitish. Summer pelage dark rich chestnut above. Total length, 5 inches; tail vertebræ, 1.3 inches; hind foot, .7 inch. Found in "Timbered valleys along edge of plains in Minnesota and eastern North and South Dakota." (Bailey)

Athabasca Red-backed Mouse.—*Evotomys gapperi athabascæ* Preble.

Resembling typical *gapperi* in size but lighter colored. Upperparts as in typical *gapperi*, but face and sides grayer; underparts white. Total length, 5.8 inches; tail vertebræ, 1.6 inches; hind foot, .72 inch. Found in vicinity of Fort Smith, Slave River, Mackenzie, Canada.

Gale Red-backed Mouse.—*Evotomys gapperi galei* (Merriam).

Lighter in color than typical *gapperi* and with slightly longer tail. Upperparts (winter) reddish chestnut, clearly differentiated from buffy gray sides; feet and underparts whitish to yellowish gray. Total length, 5.8 inches; tail vertebræ, 1.8 inches; hind foot, .72 inch. Found in "Boreal Zone of mountains of Colorado and northward along eastern ranges of Rocky Mountains to northern Montana." (Bailey)

British Columbia Red-backed Mouse.—*Evotomys gapperi saturatus* Rhoads.

Resembling typical *gapperi* but larger, longer tailed and with conspicuous areas over lateral glands of males. Upperparts bright reddish chestnut; sides dark gray; underparts

white; tail indistinctly bicolor, dark gray above, light gray below. Total length, 6 inches; tail vertebræ, 1.8 inches; hind foot, .72 inch. Found in "The Blue Mountains of Oregon, mountains of northern Idaho, and northward into British Columbia to Cariboo Lake." (Bailey)

Mogollon Red-backed Mouse.—*Evotomys limitis* Bailey.

Larger than *galei*, colors duller and grayer. Upperparts (summer) dark chestnut, with gray sides. Winter pelage grayer. Total length, 6 inches; tail vertebræ, 1.7 inches; hind foot, .8 inch. Found in the Mogollon Mountains of New Mexico.

Short-tailed Red-backed Mouse.—*Evotomys brevicaudus* (Merriam).

Differing from *gapperi* in larger hind foot and shorter tail; paler in summer pelage. Total length, 5 inches; tail vertebræ, 1.25 inches; hind foot, .76 inch. Found in "Boreal cap of Black Hills in South Dakota." (Bailey)

Carolina Red-backed Mouse.—*Evotomys carolinensis* Merriam.

Size large; tail long; color dark and rich. Upperparts (summer) dark chestnut, not sharply defined from brownish sides, sprinkled with black; ears dusky; tail faintly bicolor, blackish above, grayish below; underparts white to buffy. Winter pelage paler and brighter. Total length, 6 inches; tail vertebræ, 1.8 inches; hind foot, .8 inch. Found in "Boreal parts of Allegheny Mountains of North Carolina, Tennessee, and West Virginia [also Virginia and Maryland]." (Miller)

Ungava Red-backed Mouse.—*Evotomys ungava* Bailey.

"Size about as in *gapperi*; tail and feet slender; ears very small, not projecting beyond fur; colors dull; tail bicolor, . . . Dorsal area not sharply defined, dull brownish chestnut; sides and face buffy gray, finely lined with blackish hairs; belly dark plumbeous, heavily washed with buffy." Total length, 5.4 inches; tail vertebræ, 1.6 inches; hind foot, .76 inch. Found about Fort Chimo, Ungava, Canada.

Idaho Red-backed Mouse.—*Evotomys idahoensis* Merriam.

Larger than *gapperi*, with longer tail and grayer sides. Upperparts with well-defined, pale hazel stripe; sides clear ashy gray; feet gray; tail bicolor, blackish and gray; underparts whitish. Total length, 6 inches; tail vertebræ, 1.6 inches; hind foot, .8 inch. Found in "Mountains of south central Idaho, between Snake River and the Salmon." (Bailey)

Cascade Red-backed Mouse.—*Evotomys mazama* Merriam.

"Large, long-tailed, and bright-colored; ears not rufous; . . . side glands conspicuous in all of the adult males." (Bailey) Upperparts with rufous or hazel dorsal band blending into buffy gray of face and sides; grayish spot over lateral glands; tail sharply bicolor. Total length, 6.3 inches; tail vertebræ, 2 inches; hind foot, .75 inch. Found

along "Crest of the Cascade Mountains in Oregon." (Bailey)

Dusky Red-backed Mouse.—*Evotomys obscurus* Merriam.

"A rather large, grayish species, with small gray ears and indistinct markings; side glands inconspicuous, but easily discovered on blowing apart the fur. . . . Upperparts olive-gray, with an ill defined dorsal area of cinnamon-rufous, obscured by black hairs; lower part of sides and face clear gray; belly washed with dull buff; ears dusky, not rufous tipped; feet dusky gray; tail distinctly bicolor." Total length, 6.2 inches; tail vertebræ, 1.9 inches; hind foot, .70 inch. Found on "West slope of the southern Cascade Range and northern Sierra Nevada in southern Oregon and northern California." (Bailey)

California Red-backed Mouse.—*Evotomys californicus* Merriam.

Very large, dark, and long-tailed. "Upperparts dark bistre or sepia, becoming dusky on rump and dull, dark chestnut on back; dorsal area indistinct and shading gradually into color of sides; oval patches of dense fur covering side glands plumbeous in slight contrast to surrounding fur; belly pale buffy or soiled whitish, darkened by the plumbeous under fur; tail sharply bicolor, blackish above and at tip all round, whitish beneath; feet whitish or but slightly dusky; ears dusky, with no rufous or light-colored hairs." Total length, 6.4 inches; tail vertebræ, 2 inches; hind foot, .84 inch. Found in "Coast strip of Oregon and northern California." (Bailey)

Western Red-backed Mouse.—*Evotomys occidentalis* Merriam.

Smaller than *californicus*; tail long; dorsal area indistinct. Upperparts (summer) dull, burnt umber to dark chestnut, mixed with black; sides dark gray suffused with buffy; tail almost unicolor, dusky; feet dusky; underparts buffy. Total length, 5.8 inches; tail vertebræ, 1.8 inches; hind foot, .72 inch. Found in "Coast and Puget Sound region of Washington and southern British Columbia." (Bailey)

Olympic Red-backed Mouse.—*Evotomys nivarius* Bailey.

Resembling *occidentalis* but color lighter and brighter. Upperparts with distinct band of light chestnut; sides dark gray; tail bicolor, feet and underparts whitish. Total length, 6 inches; tail vertebræ, 2 inches; hind foot, .72 inch. Found on "Mt. Ellinor and probably other high peaks in the Olympic Mountains." (Bailey)

Labrador Red-backed Mouse.—*Evotomys proteus* Bangs.

Size large, color variable; ear and hind foot large. Usual color of upperparts sepia, merging into smoke-gray mixed with yellowish on sides; feet and underparts grayish; tail faintly bicolor. Sometimes dorsal region is bright chestnut. Total length, 6.5 inches; tail vertebræ, 2 inches; hind foot, .82 inch. Found about Hamilton Inlet, Labrador.

Northwestern Red-backed Mouse.—*Evotomys caurinus* Bailey.

Size small; colors dark; tail short. Upperparts (summer) dark rich chestnut, sprinkled with black; dorsal band very distinct; sides sepia gray, with buffy tinge; face dark gray; ears dusky; tail bicolor, above like back, below buffy; underparts whitish to buffy. Winter pelage brighter above, sides clearer gray. Total length, 5.4 inches; tail vertebræ, 1.45 inches; hind foot, .72 inch. Found in the vicinity of Malaspina Inlet, British Columbia.

Wrangell Island Red-backed Mouse.—*Evotomys wrangeli* Bailey.

Large; dull colored; short-tailed; thick-furred. Upperparts dull dark chestnut; sides sepia gray; feet dusky; tail bicolor; underparts whitish. Total length, 5.9 inches; tail vertebræ, 1.5 inches; hind foot, .8 inch. Found on Wrangell and Revillagigedo Islands, southern Alaska.

Dark-colored Red-backed Mouse.—*Evotomys phæus* Swarth.

Size rather large; tail relatively long. Upperparts dark brown, dorsal band not very distinctly outlined; sides and face yellowish brown; tail bicolor, above like back, below yellowish; underparts gray. Total length, 6.2 inches; tail vertebræ, 2 inches; hind foot, .8 inch. Found in southeastern Alaska.

Dawson Red-backed Mouse.—*Evotomys dawsoni dawsoni* Merriam.

A bright-colored form with prominent ears. Upperparts bright rusty red, lightly sprinkled with black, sharply defined from buffy sides; tail bicolor; underparts pale buffy. Total length, 5.8 inches; tail vertebræ, 1.3 inches; hind foot, .8 inch. Found "From Finlayson River and Fort Liard west to Yakutat and Juneau, and north along the coast to Norton Sound." (Miller)

Island Red-backed Mouse.—*Evotomys dawsoni insularis* Heller.

Upperparts rusty rufous; sides yellowish; tail bicolor, above like back, below yellowish brown; underparts grayish. Total length, 5.8 inches; tail vertebræ, 1.3 inches; hind foot, .78 inch. Found on Hawkins Island, Prince William Sound, Alaska.

Orca Red-backed Mouse.—*Evotomys orca* Merriam.

Size medium; colors dark. Upperparts dark chestnut to hazel; sides yellowish, mixed with black; face dark; tail above, dusky, below, buffy; underparts deep buffy. Total length, 5.6 inches; tail vertebræ, 1.3 inches; hind foot, .8 inch. Found in the vicinity of Orca, Prince William Sound, Alaska.

* * * * *

Red-backed Mice live in cool, damp localities and are essentially forest dwellers. They are usually distinguished

from the Meadow Mice, which they rather closely resemble, by the more or less conspicuous, reddish, dorsal band. When this band is lacking, as is sometimes the case, the distinction is not so apparent. As a rule, the closer, softer pelage, longer ears, and rather more slender form will identify the Red-back.

Good places to seek these Mice are about old logs or in mossy, overgrown localities. They are diurnal as well as nocturnal in habit and usually do not occur in large colonies like the Meadow Mice. They may be trapped in the same spots as *Microtus*, and use the runaways of the Meadow Mice in some places, but are not restricted to tunnels cut in the grass and wander about freely, at least in temperate regions. In the North the Red-backed Mice go to the limit of trees and are even found on the tundras. They do not hibernate but tunnel under the snow and move about in the dead of winter as freely as in summer.

The number of young varies from four to eight and there are several families a season wherever the environment is favorable to these Mice. The young are born in a grass-lined nest which is usually under the surface of the ground, but may be under a log, rocks, or in some surface shelter. Young have been noted from early April to October.

Genus *Microtus*¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Meadow Mouse.—*Microtus pennsylvanicus*

and related forms

Names.—Meadow Mouse; Meadow Vole; Field Mouse; Field Vole; Vole. Plate XXX.

General Description.—A medium-sized, robust-bodied Mouse, with long, loose pelage and comparatively short tail. Ears short, well haired, not projecting much beyond pelage; legs of normal length, hind legs not elongated; tail covered with short hairs; sole of hind foot with six tubercles; claw of thumb pointed; molar crowns bounded by a series of angles; molars rootless; upper incisors simple, ungrooved; pelage

¹ For a detailed revision of the Meadow Mice see Vernon Bailey, *North American Fauna*, No. 17, 1900. Many forms have been since described, however.

long, soft, and lax, rough in appearance; transition between color of upper and lower parts gradual; may be active at any hour of day or night.

Color.—Sexes colored alike; seasonal variation usually not very marked.

Upperparts (summer) chestnut-brown varying with the individual to yellowish chestnut, sprinkled with black along



FIG. 88. Meadow Mouse

back; feet brownish; tail above dusky, below slightly paler; underparts gray, with dusky tinge or washed with cinnamon.

Winter pelage grayer than summer.

Immature darker than adults, nearly black.

Measurements.—Sexes of equal size. Total length, 7 inches; tail vertebræ, 1.8 inches; hind foot, .85 inch.

Geographical Distribution.—Practically all of habitable North America.

Food.—Vegetation: grass, foliage, twigs, roots, seeds, bark. Many species of plants, shrubs, and trees are included in this diet and Meadow Mice may become very destructive to field crops and orchards; meat is eaten when occasion affords.

Enemies.—Preyed upon by practically every predatory creature: Snakes, Hawks, Owls, Crows, Ravens, Weasels,

MEADOW MOUSE

Foxes, Wildcats, Skunks, and all the other carnivorous mammals.

Species and Subspecies of the Genus *Microtus*.

This genus embraces so many forms that it becomes no easy task to differentiate between the various species and subspecies. In many cases, distinctions are based upon cranial characters, and these, as well as superficial characters, may be of a nature impossible to detect without an abundance of specimens. For this reason it is easiest, when attempting to identify one of these Mice, to employ a geographical method of approach. From the known ranges of Meadow Mice one can narrow down the possibilities to a comparatively few forms and at once rule out all the rest of the genus. The several varieties of Meadow Mice living in any given locality generally belong to distinct major groups of species or to different subgenera which are not so troublesome to distinguish, one from the other.

Subgenus *Microtus*

Characterized by six plantar tubercles; lateral glands in skin over hips (adult males); ears generally projecting beyond fur; mammae normally 8 in number, 4 inguinal, 4 pectoral; and by various dental characters.

Pennsylvanicus Group

Ord Meadow Mouse; Eastern Meadow Mouse; Pennsylvania Meadow Mouse.—*Microtus pennsylvanicus pennsylvanicus* (Ord.) Plate XXX.

As described above. Found in "Eastern United States and westward as far as Dakota and Nebraska, shading into *modestus* of the western plains and Rocky Mountains. In a general way it occupies the Transition Zone from the Atlantic coast to the edge of the Great Plains." (Bailey)

Albermarle Meadow Mouse.—*Microtus pennsylvanicus nigrans* Rhoads.

Larger and darker than typical *pennsylvanicus*. Upperparts (summer) dull bistre mixed with black; feet blackish; tail black above, sooty below; underparts ashy, sometimes with cinnamon wash. Winter pelage darker than summer, almost black on back. Total length, 7 inches; tail vertebrae, 2 inches; hind foot, .95 inch. Found in "Coast region of northern North Carolina and southern Virginia in the Austroriparian Zone." (Bailey)

Acadian Mouse.—*Microtus pennsylvanicus acadicus* Bangs.

Smaller and paler than typical *pennsylvanicus*. Upperparts (summer) yellowish bister sprinkled with black; tail indistinctly bicolor, above dusky, below slightly lighter; underparts ashy. Winter pelage.—Buffy gray above, belly washed with pure white; tail sharply bicolor, blackish and white. Total length, 6.8 inches; tail vertebræ, 1.9 inches; hind foot, .84 inch. Found in "Nova Scotia and Prince Edward Island." (Bailey)

Sawatch Meadow Mouse.—*Microtus pennsylvanicus modestus* (Baird).

Resembling typical *pennsylvanicus* in size but more yellow in color. Upperparts (summer) dull ochraceous, sprinkled with black; tail faintly bicolor, blackish and dull grayish; feet slaty; underparts soiled whitish to ashy or cinnamon. Winter pelage with many black hairs along upperparts; underparts with wash of creamy white; tail more distinctly bicolor than in summer. Total length, 7 inches; tail vertebræ, 1.8 inches; hind foot, .82 inch. Found in "Rocky Mountains and western Plains from New Mexico to British Columbia, and from the Black Hills of South Dakota to central Idaho, and beyond, with slight variation, to the plains of the Columbia, mainly in Transition Zone." (Bailey)

Badland Meadow Mouse; Bean Mouse.—*Microtus pennsylvanicus wahema* Bailey.

Paler than typical *pennsylvanicus* and slightly smaller. Upperparts buffy, sides grayer; underparts pale gray. Total length, 7.1 inches; tail vertebræ, 1.7 inches; hind foot, .8 inch. Found in the Badlands section of the Missouri River valley and westward over southwestern North Dakota and eastern Montana.

Forest Meadow Mouse.—*Microtus pennsylvanicus fontigenus* (Bangs).

Smaller than typical *pennsylvanicus*. Upperparts (autumn) dark bister mixed with black, darker on back than sides; feet slaty; tail bicolor, blackish and grayish; underparts washed with whitish or ashy. Total length, 6 inches; tail vertebræ, 1.8 inches; hind-foot, .84 inch. Found in "Eastern Canada, in the Hudsonian Zone." (Bailey)

Little Labrador Meadow Mouse.—*Microtus pennsylvanicus labradorius* Bailey.

"Color.—(Much changed by alcohol.) Upperparts dark brownish; belly whitish; tail bicolor; feet pale." (Bailey) Total length, 5.6 inches; tail vertebræ, 1.6 inches; hind foot, .8 inch. Known only from Fort Chimo, Ungava, Laborador.

Block Island Meadow Mouse.—*Microtus provectus* Bangs.

Resembling typical *pennsylvanicus* but larger, underparts always gray. Upperparts yellowish brown mixed with dark brown; tail indistinctly bicolor, dusky above, grayish

below; underparts clear gray, whitish along middle of belly and between arms. Total length, 7 inches; tail vertebræ, 2 inches; hind foot, .88 inch. Found only on Block Island, Newport County, Rhode Island.

Drummond Meadow Mouse.—*Microtus drummondi* (Audubon and Bachman).

Smaller than typical *pennsylvanicus*, paler in color. Upperparts (summer) yellowish bister sprinkled with dark brown or black-tipped hairs; more yellowish on sides of nose and in front of ears; feet silvery gray; tail bicolor, blackish and whitish; underparts white, sometimes washed with buffy. Winter pelage paler, yellower on ears and nose. Total length, 5.9 inches; tail vertebræ, 1.6 inches; hind foot, .72 inch. Found "From Hudson Bay to the west slope of the Rocky Mountains and Alaska, and from the northern edge of the United States north to Fort Anderson, N.W.T., in Canadian and Hudsonian Zones." (Bailey)

Admiralty Island Meadow Mouse.—*Microtus admiraltiae* Heller.

Resembling *drummondi* but grayer. "Upperparts grizzled grayish brown, the brown predominating; sides somewhat paler and grayer but changing rather abruptly to the light grayish wash of the underparts. Feet grayish. Tail well haired, sharply bicolor, dusky brown above, whitish below." (Heller) Total length, 6.2 inches; tail vertebræ, 1.8 inches; hind foot, .84 inch. Found only on Admiralty Island, Alaska.

Barren Ground Meadow Mouse.—*Microtus aphorodemus* Preble.

Similar to *drummondi* but larger. Upperparts dark yellowish brown sprinkled with yellow-tipped hairs; underparts whitish to grayish, sometimes with wash of light brown. Total length, 7.6 inches; tail vertebræ, 2 inches; hind foot, .8 inch. Found on the Barren Grounds of Keewatin from the vicinity of Cape Churchill (west coast of Hudson Bay) northward; limits of range unknown.

Aztec Meadow Mouse.—*Microtus aztecus* (Allen).

Resembling typical *pennsylvanicus* in size, but tail shorter and foot larger. Upperparts (winter) dull buffy sprinkled with many black hairs; feet slate-colored; tail sharply bicolor, black and soiled white; underparts washed with creamy or pale buff. Total length, 6.9 inches; tail vertebræ, 1.7 inches; hind foot, .88 inch. Found in "Valley of the San Juan River in northwestern New Mexico, in Transition Zone." (Bailey)

Large Labrador Meadow Mouse.—*Microtus enixus* Bangs.

Large and darker than typical *pennsylvanicus*. Upperparts (summer) mixed dark yellowish bister and blackish; feet dusky; tail above, black, below, grayish brown; underparts ashy, occasionally with buffy wash. Total length, 7.6 inches; tail vertebræ, 2.7 inches; hind foot, .9 inch.

Found on "Eastern coast of Labrador from Hamilton Inlet to Ungava Bay, in Hudsonian Zone." (Bailey)

Newfoundland Meadow Mouse.—*Microtus terrænovæ* (Bangs). Somewhat larger than typical *pennsylvanicus* and yellower. Upperparts (summer) dark russet sprinkled with brownish, paler on sides and face; patch on nose dark buffy to dull russet; feet grayish brown; tail bicolor, blackish and soiled whitish; underparts ashy with median longitudinal streak of dusky cinnamon. Winter pelage paler above and below, with more contrast. Total length, 7.3 inches; tail vertebræ, 2.1 inches; hind foot, .94 inch. Found in Newfoundland and Penguin Island.

Beach Meadow Mouse.—*Microtus breweri* (Baird).

Larger and paler than typical *pennsylvanicus*; pelage long and coarse; upperparts (summer) buffy gray sparingly sprinkled with brown and black; sides paler; feet silvery gray; tail bicolor, rusty brown to blackish and soiled whitish. Total length, 7.3 inches; tail vertebræ, 2.2 inches; hind foot, .9 inch. Found only on Muskeget Island, Massachusetts.

Gull Island Meadow Mouse.—*Microtus nesophilus* Bailey.

Resembling *pennsylvanicus* in size but darker. Upperparts (summer) mixed dark yellowish bistre and black; nose and face dark; feet blackish; tail above, blackish, below, dark brown; underparts dusky, tinged with cinnamon. Total length, 7.4 inches; tail vertebræ, 1.6 inches; hind foot, .84 inch. Found only on Great Gull Island, at entrance to Long Island Sound, New York, and probably now extinct.

Montanus¹ Group

Peale Meadow Mouse.—*Microtus montanus montanus* (Peale)

Size about that of typical *pennsylvanicus*; color dark; hip glands of male conspicuous; ears very hairy. Upperparts mixed bistre or ashy and blackish; feet slate-colored; lips usually touched with white; tail faintly bicolor, blackish and slate-colored; underparts ashy. Total length, 7 inches; tail vertebræ, 2.1 inches; hind foot, .86 inch. Found in "Northeastern California, eastern Oregon, northern Utah and Nevada, in the Upper Sonoran and Transition Zones." (Bailey)

Yosemite Meadow Mouse.—*Microtus montanus yosemite* Grinnell.

Resembling typical *montanus* in size but lighter colored. Upperparts buff to light buckthorn-brown mixed with blackish; sides much lighter; feet gray; tail bicolor, brown or

¹ For a recent revision of such of the forms of this group as occur in California see Remington Kellogg, Univ. of California Publ. in Zoology, Vol. 21, No. 7, pp. 245-274, 1922.

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black and gray; underparts gray to whitish. Total length, 7 inches; tail vertebræ, 1.8 inches; hind foot, .84 inch. Found in "Sierra Nevada and Great Basin regions of eastern California from head of San Joaquin River, in Fresno County, north to Goose Lake, Modoc County, west to vicinity of Cassel, Shasta County, and east across the Nevada line. Vertical range from 3000 feet up to 10,350 feet; zonal range Transition to Hudsonian." (Kellogg)

Cary Meadow Mouse.—*Microtus montanus caryi* Bailey.

Resembling typical *montanus* in size but paler and with shorter tail. Upperparts (spring pelage) warm buffy gray grizzled with black; sides of nose clear buff; tail above dusky, below whitish; underparts and feet white to silvery gray. Total length, 7.1 inches; tail vertebræ, 1.8 inches; hind foot, .84 inch. Found in Wyoming "along streams in the arid sagebrush country of the Bear River, Green River, and Wind River Valleys . . ." (Bailey)

Arizona Meadow Mouse.—*Microtus montanus arizonensis* Bailey.

Resembling typical *montanus* but brighter colored. Upperparts (winter) yellowish to rusty brown; feet dark grayish; tail bicolor, blackish and grayish; underparts whitish. Total length, 7 inches; tail vertebræ, 2 inches; hind foot, .8 inch. Found in "Plateau country of eastern Arizona, at head of Little Colorado, in the Transition Zone." (Bailey).

Utah Meadow Mouse.—*Microtus montanus rivularis* (Bailey).

Larger than typical *montanus*, lighter in color. Upperparts (winter) dull bistre sprinkled with black; sides almost as dark as back; feet dull grayish; tail bicolor, blackish and grayish; underparts whitish. Total length, 7.2 inches; tail vertebræ, 1.9 inches; hind foot, .9 inch. Found in Washington County, Utah, "probably restricted to Lower Sonoran Zone." (Bailey)

Dwarf Meadow Mouse.—*Microtus nanus nanus* (Merriam).

"Size small; tail short; ears short and rounded; color dark grayish; skull slender." (Bailey) Upperparts (summer) everywhere mixed gray, sepia, and blackish; feet grayish; tail bicolor, dusky gray and whitish; underparts whitish. Total length, 6 inches; tail vertebræ, 1.6 inches; hind foot, .72 inch. Found in "Rocky Mountains and outlying ranges, from central Idaho southward to central Nevada and southern Colorado, in Canadian Zone." (Bailey)

Gray Meadow Mouse.—*Microtus nanus canescens* Bailey.

Lighter gray than typical *nanus*; adult males with conspicuous hip glands. Upperparts (summer) mixed pale buffy and black producing general dark gray tone; sides lighter than back; feet dark gray; tail bicolor, blackish and grayish; underparts white. Total length, 6 inches; tail vertebræ, 1.7 inches; hind foot, .8 inch. Found in "Northern Washington and southern British Columbia, east of the

Cascades. Apparently confined to the Transition Zone." (Bailey)

Gray-tailed Meadow Mouse.—*Microtus canicaudus* Miller.

Resembling typical *nanus* but yellower, tail grayer. Upperparts (winter) bright yellowish bister sprinkled with black; sides paler; feet grayish; tail unicolor, grayish, with faint dusky dorsal line. Summer pelage much as in winter, tail more dusky on upperside. Total length, 5.6 inches; tail vertebrae, 1.4 inches; hind foot, .8 inch. Found in "Willamette Valley, Oregon, and the east base of the Cascades in southern Washington, in Transition Zone." (Bailey)

Dutcher Meadow Mouse.—*Microtus dutcheri* Bailey.

"Size rather small; tail short; ears small, nearly concealed by fur; color dark above and below; lips and usually nose white; hip glands present in adult males." Upperparts (summer) dark bister and brown; feet grayish; tail bicolor, dusky and whitish; underparts dull cinnamon to buffy brown. Total length, 6.5 inches; tail vertebrae, 1.5 inches; hind foot, .82 inch. Found in "Hudsonian Zone of the southern Sierra Nevada." (Bailey)

Nevada Meadow Mouse.—*Microtus nevadensis* Bailey.

"Size large; ears small; tail rather short; fur coarse and lax; colors dark; hip glands conspicuous in adult males." (Bailey) Upperparts (winter) dark sepia or bister, heavily sprinkled with blackish; sides lighter; feet dark gray; tail faintly bicolor, blackish and gray; usually white on lips and tip of nose; underparts ashy. Total length, 8 inches; tail vertebrae, 2 inches; hind foot, 1.0 inch. Found in Nye County (Ash Meadows) and Pahrangat Valley, Nevada, Lower Sonoran Zone.

Californicus¹ Group

West-central California Meadow Mouse.—*Microtus californicus californicus* (Peale).

Size medium; ears large and rising well above fur; hip glands on adult males; pelage coarse and harsh. Upperparts ochraceous tawny to cinnamon-buff, sprinkled with blackish; sides with less black; feet grayish; tail bicolor, dark clove-brown and gray; underparts gray. Total length, 7 inches; tail vertebrae, 1.8 inches; hind foot, .88 inch. Found in "Coastal region of west-central California, west of San Joaquin Valley, from Pozo, San Luis Obispo County, north to San Francisco, and to Walnut Creek, Contra Costa County. Vertical range from sea level up at least to 2800 feet; zonal range Upper Sonoran and Transition." (Kellogg)

¹ For a recent and full revision of this group see Remington Kellogg, University of California Publications in Zoology, Vol. 21, No. 1, pp. 1-42, 1918.

Cape Mendocino Meadow Mouse.—*Microtus californicus constrictus* Bailey.

Size slightly smaller than typical *californicus*; color duller. Upperparts from buckthorn-brown to ochraceous tawny, sprinkled with blackish hairs; underparts grayish, rest of pelage about as in typical *californicus*. Total length, 6.8 inches; tail vertebræ, 2 inches; hind foot, .84 inch. Found in "Northwest coast of California in vicinity of Cape Mendocino, Humboldt County, from Capetown north to Eureka and interiorly to Fair Oaks and Cuddeback. Vertical range from sea level up at least to 1000 feet; zonal range Transition." (Kellogg)

Sanhedrin Meadow Mouse.—*Microtus californicus eximius* R. Kellogg.

Distinguished from typical *californicus* chiefly by cranial characters; color about as in typical *californicus*, except that tail is dark fuscous black above instead of dark brown. Total length, 7.2 inches; tail vertebræ, 2 inches; hind foot, .88 inch. Found in "Northwestern California (excepting a narrow coastal strip from Cape Mendocino north to Oregon line), and south-central Oregon; from Olema, Marin County, California, east to Rumsey, Yolo County, and north to Drain, in the Umpqua River Valley, Oregon. Vertical range from sea level up to 7500 feet; zonal range Upper Sonoran and Transition." (Kellogg)

Tule Meadow Mouse.—*Microtus californicus astuarinus* R. Kellogg.

Large in size, dark in color. Upperparts near cinnamon-buff sprinkled with black; lighter on sides and rump due to absence of black hairs; lips whitish; nose dark; tail bicolor, blackish and gray; feet dark brown; underparts grayish. Total length, 8 inches; tail vertebræ, 2.4 inches; hind foot, .96 inch. Found in "San Joaquin and Sacramento River valleys, from Tulare Lake, Kings County, north to Chico, Butte County, and east to near Galt, in San Joaquin County; also west along north side of San Francisco Bay to Bolinas, Marin County. Vertical range from sea level up to hardly 500 feet; zonal range Lower and Upper Sonoran." (Kellogg)

Mariposa Meadow Mouse.—*Microtus californicus mariposæ* R. Kellogg.

Size large, color warm brown. Upperparts tawny olive or pinkish buff sprinkled with blackish; sides and rump with less black than back; feet gray; tail bicolor, blackish and gray; underparts gray. Total length, 8 inches; tail vertebræ, 2.4 inches; hind foot, .96 inch. Found in "Western foothill region of Sierra Nevada, from Minkler, Fresno County, north to Dutch Flat, Placer County. Vertical range from 200 feet up to at least 3800 feet; zonal range Upper Sonoran and Transition." (Kellogg)

Owens Valley Meadow Mouse.—*Microtus californicus valli-cola* Bailey.

Large and dark. Upperparts mixed buff and dark brown or black; feet gray; tail bicolor, black and gray; underparts gray. Total length, 7.6 inches; tail vertebrae, 2.4 inches; hind foot, .96 inch. Found in "Owens Valley region of California, east of Sierra Nevada, from Olancho, Inyo County, north to Benton, Mono County; east to head of Willow Creek in north end of Panamint Mountains. Vertical range from 3700 feet up at least to 5400 feet; zonal range Lower and Upper Sonoran." (Kellogg)

Amargosa Meadow Mouse.—*Microtus californicus scirpensis* (Bailey).

Large and bright-colored. Upperparts cinnamon-buff to buckthorn-brown, with light sprinkling of black; sides lighter; rest of pelage about as in typical *californicus*. Total length, 8.5 inches; tail vertebrae, 2.7 inches; hind foot, 1.0 inch. Found only in "a small tule marsh at a spring near Shoshone on the Amargosa River, in eastern Inyo County. Altitude of station 1500 to 1600 feet; zonal range Lower Sonoran." (Kellogg)

Kern River Meadow Mouse.—*Microtus californicus kernensis* R. Kellogg.

Size large, color light. Upperparts clay color to cinnamon-buff, with light sprinkling of blackish brown; sides lighter; feet gray; tail bicolor, warm sepia and whitish; underparts gray. Total length, 7.6 inches; tail vertebrae, 2.5 inches; hind foot, .96 inch. Found in "Kern River basin, from Taylor Meadow, Tulare County, west to Bakersfield and Fort Tejon, Kern County. Vertical range from 400 feet up to 7000 feet; zonal range Lower Sonoran to Transition." (Kellogg)

Mohave River Meadow Mouse.—*Microtus californicus mohavensis* R. Kellogg.

Size large. Upperparts ochraceous tawny to cinnamon-buff, lightly sprinkled with blackish; sides with less black; feet gray; tail bicolor, brownish or blackish and pale gray; underparts gray. Total length, 8 inches; tail vertebrae, 2.6 inches; hind foot, .96 inch. Found in a "limited area along the Mohave River, in San Bernardino County, from Victorville north to Oro Grande. Vertical range from 2500 feet up at least to 2700 feet; zonal range Lower Sonoran." (Kellogg)

Southern California Meadow Mouse.—*Microtus californicus sanctidiegi* R. Kellogg.

Size large. Upperparts buckthorn-brown to cinnamon-buff, lightly sprinkled with blackish; sides brighter; rump without black hairs; feet grayish white; tail usually bicolor, blackish and whitish; underparts grayish in general tone, often with light buffy wash on breast. Total length, 8 inches; tail vertebrae, 2.2 inches; hind foot, .96 inch.

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Found in "San Diegan faunal district, from Mountain Spring and mouth of Tiajuana River, San Diego County, northwest to Gaviota Pass, Santa Barbara County, and north to Bluff Lake, San Bernardino Mountains, San Bernardino County. Vertical range from sea level up at least to 9000 feet; zonal range Lower Sonoran to Canadian." (Kellogg)

Operarius Group

Tundra Meadow Mouse.—*Microtus operarius operarius* (Nelson).

"Size small; tail short, densely haired; ears small and wholly concealed in long winter fur; colors yellowish." (Bailey) Upperparts (winter) dark, rich buff lightly sprinkled with black on dorsal region; sides with less black; feet gray; tail with faint blackish line on upper side, dirty whitish on sides and undersurface, underparts pale buffy to creamy white. Summer pelage darker yellow above, more buffy below. Total length, 6.7 inches; tail vertebræ, 1.6 inches; hind foot, .8 inch. Found on "Barren grounds from Bristol Bay, St. Michael, and Kowak River, Alaska, east to Anderson River." (Bailey)

Interior Meadow Mouse.—*Microtus operarius endæcus* Os-good.

Resembling typical *operarius* in size and color, but with slightly larger skull; distinguished from *drummondi* by yellowish coloration, especially by buffy yellow underparts. Total length, 6.7 inches; tail vertebræ, 1.5 inches; hind foot, .8 inch. Found in east central Alaska.

Macfarlane Meadow Mouse.—*Microtus macfarlani* Merriam. Resembling *operarius* but with shorter tail; pelage very long in winter. Upperparts (winter) light buffy gray; feet gray; tail bicolor, black and white; underparts whitish. Summer pelage darker, more buffy. Tail vertebræ, 1.2 inches; hind foot, .75 inch. Found in "Tundra region of Arctic America, east of the Mackenzie River." (Bailey)

Yakutat Meadow Mouse.—*Microtus yakutatensis* Merriam. Size of *operarius*, pelage dusky. Upperparts (summer) dusky gray, with light wash of brownish dorsally; feet gray; tail bicolor, black and whitish; underparts soiled whitish to pale buffy. Total length, 6.5 inches; tail vertebræ, 1.5 inches; hind foot, .8 inch. Found on "Mainland of Alaska from Glacier Bay to Prince William Sound." (Bailey)

Kadiak Meadow Mouse.—*Microtus kadiacensis* Merriam. Larger than *yakutatensis*; underparts white; ears small. Upperparts (summer) yellowish brown sprinkled with a few black hairs on dorsal region; feet gray; tail faintly bicolor, black and whitish; underparts with wash of clear white. Total length, 7.5 inches; tail vertebræ, 2 inches; hind foot, .84 inch. Found only on Kadiak Island, Alaska.

Unalaska Meadow Mouse.—*Microtus unalascensis unalascensis* Merriam.

Larger and heavier than *operarius*; underparts white; upperparts dull yellowish brown, darkened on head and rump; tip of nose whitish; feet gray; tail bicolor, blackish and soiled white; underparts white to soiled whitish. Total length, 7.2 inches; tail vertebræ, 1.5 inches; hind foot, .88 inch. Found only on Island of Unalaska, Alaska.

Popof Island Meadow Mouse.—*Microtus unalascensis popofensis* Merriam.

Resembling typical *unalascensis* but with no white on nose. Upperparts and underparts as in typical *unalascensis* except that nose is dusky to tip. Total length, 7.5 inches; tail vertebræ, 1.7 inches; hind foot, .88 inch. Found only on Popof Island, Alaska.

Sitka Meadow Mouse.—*Microtus sitkensis* Merriam.

Size of *unalascensis* which it somewhat resembles in color. Upperparts (summer) rusty brown, sprinkled with blackish, brownest on nose and rump; sides with less black; nose blackish; feet grayish; tail bicolor, black and pale buff; underparts dark buff. Total length, 7.6 inches; tail vertebræ, 1.8 inches; hind foot, .92 inch. Found only on Baranof Island, Alaska.

Innuvit Meadow Mouse.—*Microtus innuitus* Merriam.

Size large; tail sharply bicolor. Known only from imperfect specimens from owl pellets and hence most of external characters are unknown. Tail vertebræ, 1.6 inches; hind foot, .92 inch. Found only on St. Lawrence Island, Bering Sea, Alaska.

Montague Island Meadow Mouse.—*Microtus elymocetes* Osgood.

Size large for the *operarius* group; resembling typical *operarius* in color but slightly darker, with underparts heavily washed with buffy. Upperparts raw umber in tone, mixed cinnamon and dusky; forefeet dusky brown; hind feet grayish white on toes, dusky brown on "ankles"; tail sharply bicolor, dusky brownish above, whitish gray below. Total length, 8 inches; tail vertebræ, 1.6 inches; hind foot, .9 inch. Found only on Montague Island, Prince William Sound, Alaska.

Abbreviatus Group

Hall Island Meadow Mouse.—*Microtus abbreviatus abbreviatus* Miller.

Size large; tail very short; feet large and strong; ears hidden in long fur. Upperparts (summer) dark buff; feet dirty white; tail bicolor, dark brownish and creamy; underparts creamy white to pale buff. Total length, 6.4 inches; tail vertebræ, 1.0 inches; hind foot, .93 inch. Found only on Hall Island, Bering Sea, Alaska.

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St. Matthew Island Meadow Mouse.—*Microtus abbreviatus fisheri* Merriam.

Slightly larger and darker than typical *abbreviatus*. Upperparts (summer) dark rich buff, sprinkled with black dorsally; feet buffy; tail with faint dusky line above, sides and under surface buff; underparts strongly buffy. Total length, 6.6 inches; tail vertebræ, 1.1 inches; hind foot, .90 inch. Found only on St. Matthew Island, Bering Sea, Alaska.

Alaska Mountain Vole.—*Microtus miurus miurus* Osgood.

Resembling *abbreviatus* of which it is a miniature. Upperparts uniform pale tawny to pale buffy gray, more or less mixed with black; underparts washed with buffy; tail above, dusky, below, buffy. Total length, 6 inches; tail vertebræ, 1.2 inches; hind foot, .8 inch. Found above timber line in the mountains near Hope City, Turnagain Arm, Cook Inlet, Alaska.

Toklat River Vole.—*Microtus miurus oreas* Osgood.

"Similar to *M. miurus* but tone of color more ochraceous (not so yellowish) throughout; tail slightly shorter and chiefly ochraceous, slightly or not at all darker above than below." (Osgood) Found about the head of Toklat River, Alaskan Range, Alaska.

Townsendii Group

Townsend Meadow Mouse.—*Microtus townsendii* (Bachman).

Very large in size; ears conspicuous; adult males with well-developed hip glands. Upperparts (summer) Vandyke brown, plentifully sprinkled with black; sides dark buffy gray; tail almost monochrome, blackish above, slightly lighter below; feet dark gray; underparts grayish to dusky. Winter pelage lighter above (grayer) and below. Total length, 8 inches; tail vertebræ, 2.6 inches; hind foot, 1.02 inches. Found in low country west of the Cascades, from the Puget Sound region south along the coast as far as Eureka, California, up the valleys of the Willamette and Rogue Rivers.

Vancouver Meadow Mouse.—*Microtus tetramerus* (Rhoads).

Resembling *townsendii* but slightly smaller. Pelage practically identical to that of *townsendii*. Total length, 7.2 inches; tail vertebræ, 2.2 inches; hind foot, .9 inch. Found on the southern end of Vancouver Island, British Columbia.

Longicaudus Group

Long-tailed Meadow Mouse.—*Microtus longicaudus* (Merriam).

Resembling *pennsylvanicus* in body size but tail longer, ears larger, and color grayer. Upperparts (summer)

dull bister sprinkled with black; sides grayer; feet dark gray; tail faintly bicolor, blackish and soiled whitish; underparts dull buffy gray. Winter pelage grayer above, tail more distinctly bicolor. Total length, 7.4 inches; tail vertebræ, 2.6 inches; hind foot, .84 inch. Found in higher parts of the Black Hills, South Dakota, and down the valleys of some of the cold streams into the Transition Zone.

Cantankerous Meadow Mouse.—*Microtus mordax mordax* (Merriam).

Resembling *longicaudus*; no conspicuous hip glands in males. Upperparts (summer) grayish bister; sides grayer; nose dusky; feet dark gray; tail faintly bicolor, dusky and soiled whitish; underparts whitish. Winter pelage lighter colored, more contrast between dorsal region and sides; underparts whiter; tail sharply bicolor; feet whitish. Total length, 7.4 inches; tail vertebræ, 2.8 inches; hind foot, .88 inch. Found in "Rocky Mountains and outlying ranges from latitude 60° to northern New Mexico, and south in the Cascades and Sierra Nevada as far as Kaweah and Kern rivers, California. In the Cascades mainly confined to the east slope, but extending west to the Siskiyou, in southern Oregon, and Salmon and Trinity mountains, in northern California. Found in most of the isolated ranges of eastern Oregon and northern and central Nevada. Common in Canadian and Hudsonian Zones." (Bailey)

Sierra Nevada Meadow Mouse.—*Microtus mordax sierræ* R. Kellogg.

Resembling typical *mordax* but color of upperparts and sides slightly darker. Upperparts mixed cinnamon-buff to tawny olive and brownish black to black; rump and sides grayer; underparts pale gray. Total length, 7.8 inches; tail vertebræ, 2.7 inches; hind foot, .88 inch. Found in eastern and northern California and adjoining parts of Oregon, in Sierra Nevada, White, and Trinity Mountains.

San Bernardino Meadow Mouse.—*Microtus mordax bernardinus* Merriam.

Very much like typical *mordax* in size and color but differing in skull characters. Total length, 7.3 inches; tail vertebræ, 2.5 inches; hind foot, .88 inch. Found in the San Bernardino Mountains of southern California from 7500–9050 feet above sea-level.

Tillamook Meadow Mouse.—*Microtus mordax abditus* A. B. Howell.

A very large, dark subspecies of *mordax*. Most nearly like *macrurus* but darker and with longer foot and tail. Total length, 8.8 inches; tail vertebræ, 3.7 inches; hind foot, 1.14 inches. Found "along the humid coast strip from the mouth of the Columbia River to southern Oregon; or possibly into extreme northern California." (Howell)

MEADOW MOUSE

Olympic Meadow Mouse.—*Microtus mordax macrurus* (Merriam).

Resembling typical *mordax* but larger and darker. Upperparts (summer) dark bister, heavily sprinkled with black; sides paler; feet dark gray; tail bicolor, blackish or brownish and soiled whitish; usually tipped with white; underparts dull buffy to whitish. Total length, 8.2 inches; tail vertebræ, 3.2 inches; hind foot, .96 inch. Found in Olympic Mountains, and Mt. Rainier, Washington, and along the coast strip of British Columbia and Alaska north to Yakutat; possibly as far south as the Columbia River.

Coronation Island Meadow Mouse.—*Microtus coronarius* Swarth.

Much like *macrurus* in coloration but much larger. Upperparts dark Vandyke brown mixed with black; sides of head much paler; feet grayish white; tail bicolor, above brownish black, below whitish. Total length, 8.6 inches; tail vertebræ, 3.4 inches; hind foot, 1 inch. Found on Coronation and Warren Islands, Alaska.

Coast Meadow Mouse.—*Microtus angusticeps* Bailey.

"Smaller and darker colored than typical *mordax*." (Bailey) Upperparts (summer) dark bister, sprinkled with black; face and nose darker, sides paler; feet dark gray; tail bicolor, blackish and soiled whitish; underparts creamy white. Total length, 6.8 inches; tail vertebræ, 2.2 inches; hind foot, .88 inch. Found in the "Coast region of north-western California and southwestern Oregon." (Bailey)

Mountain Meadow Mouse.—*Microtus alticola alticola* (Merriam).

Resembling *longicaudus* but with shorter tail and smaller hind foot and ear. Upperparts (summer) sepia to dull bister, with sprinkling of black; sides a little paler; feet grayish; tail faintly bicolor, blackish to grayish; underparts pale buffy to whitish. Total length, 7 inches; tail vertebræ, 2.2 inches; hind foot, .8 inch. Found in "Boreal Zone of San Francisco Mountain (Arizona), from 8,200 feet altitude up to timberline at 11,000 feet." (Bailey)

Graham Mountain Meadow Mouse.—*Microtus alticola leucophæus* (Allen).

Resembling typical *alticola* but slightly larger. Upperparts and underparts as in typical *alticola*. Total length, 7 inches; tail vertebræ, 2 inches; hind foot .9 inch. Found only in the Graham Mountains, Graham County, Arizona.

Mexicanus Group

Guadalupe Meadow Mouse.—*Microtus mexicanus guadalupensis* Bailey.

A small to medium-sized Mouse with short tail. "Upperparts dull umber brown; belly buffy gray; feet and tail brownish gray." (Bailey) Total length, 6 inches; tail

vertebræ, 1.4 inches; hind foot, .8 inch. Found in the Guadalupe Mountains, El Paso County, Texas; in Transition Zone.

Mogollon Mountain Meadow Mouse.—*Microtus mogollonensis* (Mearns).

"Size small; tail and feet short; color dull rusty brown; fur long and soft; ears not concealed. . . . Upperparts dull rusty brown, brightest on tips of ears; sides slightly paler; belly cinnamon or buffy gray; feet grayish brown; tail brownish gray above, grayish below." (Bailey) Total length, 5.2 inches; tail vertebræ, 1.14 inches; hind foot, .72 inch. Found in "Plateau country of central Arizona." (Bailey)

Xanthognathus Group

Yellow-cheeked Meadow Mouse.—*Microtus xanthognathus* (Leach).

Size very large; yellow on nose and ear patch; side glands in adult males. Upperparts (early summer) dark sepia to bister, heavily sprinkled with coarse, black hairs; bright rusty yellowish on sides of nose and ear patch and a wash of same shade about eye and on cheek; tail faintly bicolor, blackish and dusky gray; feet sooty; underparts dusky gray, sooty on pectoral region. Total length, 8.6 inches; tail vertebræ, 2 inches; hind foot, 1.04 inches. Found in "Northwestern Canada and Alaska, from central Alberta north to the Arctic coast and west to central Alaska." (Bailey)

Chrotorrhinus Group

Rock Vole.—*Microtus chrotorrhinus chrotorrhinus* (Miller).

Resembling *pennsylvanicus* in size and general proportions, but hind foot smaller, ears larger, and color much different. Upperparts (summer) bright glossy bister sprinkled with black; dull orange-rufous from nose to eyes; yellowish about ears and rump; feet dark gray; tail above, grayish brown, below, slightly paler; underparts dark gray. Winter pelage darker and with more rusty above. Total length, 6.8 inches; tail vertebræ, 1.9 inches; hind foot, .78 inch. Found in "Mount Washington, the Catskills, central Quebec, and northern New Brunswick, in the Hudsonian Zone." (Bailey)

Gray Rock Vole.—*Microtus chrotorrhinus rarus* Bangs.

Grayer than typical *chrotorrhinus* and more yellow on nose and face. Upperparts (summer) grayish bister; yellowish on nose, face, and rump; feet buffy gray; tail above, brownish, below, slightly paler; underparts dark gray washed with white. Total length, 6.5 inches; tail vertebræ, 2 inches; hind foot, .86 inch. Found about Black Bay, Strait of Belle Isle, Labrador.

MEADOW MOUSE

Subgenus *Aulacomys*

Characterized by conspicuous side glands on adult males; a musk-bearing anal gland; five plantar tubercles; large feet; long tail; long and full pelage.

Richardson Meadow Mouse.—*Microtus richardsoni richardsoni* (De Kay).

Largest of the American Meadow Mice. Upperparts (winter) grayish sepia sprinkled with black; sides paler; feet silvery gray; tail bicolor, dusky and soiled whitish; underparts washed with white. Total length, 9 inches; tail vertebræ, 2.5 inches; hind foot, 1.12 inches. Found in the vicinity of Jasper House and Henry House, Alberta, Canada.

Big-footed Meadow Mouse.—*Microtus richardsoni macropus* (Merriam). Plate XXX.

Resembling typical *richardsoni* but somewhat smaller. Upperparts (summer) dark sepia mixed with black; sides paler; feet dark gray; tail bicolor, sooty and whitish; underparts washed with silvery white. Winter pelage grayer above, with less black; more white below. Total length, 8.8 inches; tail vertebræ, 2.8 inches; hind foot, 1.12 inches. Found in "Boreal Zone of the Rocky Mountains from the Wasatch north to Canada, of the Wind River Mountains of Wyoming, the Blue Mountains of Oregon, and most of the intermediate ranges." (Bailey)

Cascade Meadow Mouse.—*Microtus richardsoni arvicoloides* (Rhoads).

Size of typical *richardsoni*, larger than *macropus*, darker than either. Upperparts (summer); dark sepia mixed with black; feet dusky gray; tail bicolor, blackish and soiled whitish; underparts lightly washed with gray to silvery white. Winter pelage darker above, more white below. Total length, 9.4 inches; tail vertebræ, 3.2 inches; hind foot, 1.16 inches; maximum size, total length, 10 inches; tail vertebræ, 3.6 inches. Found in "Boreal Zone of the Cascade Mountains, in Washington and Oregon." (Bailey)

Subgenus *Pedomys*

Characterized by presence of five plantar tubercles; long, coarse fur; side glands wanting or indiscernible; ears of medium size.

Prairie Meadow Mouse.—*Microtus ochrogaster* (Wagner).

Resembling *pennsylvanicus* in size, but tail shorter and pelage coarser. Upperparts (winter) dark gray, grizzled black and pale fulvous; sides paler; feet dusky; tail bicolor, dusky and buffy; underparts pale cinnamon to fulvous. Summer pelage darker. Total length, 6 inches;

tail vertebræ, 1.3 inches; hind foot, .8 inch. Found in "Central part of Mississippi Valley from southern Wisconsin to southern Missouri and Fort Reno, Oklahoma, and west into eastern Nebraska and Kansas." (Bailey)

Louisiana Meadow Mouse.—*Microtus ludovicianus* Bailey.

Resembling *ochrogaster* in size and color, but differing in cranial characters (slenderer rostrum and nasals, and larger bullæ). Upperparts (winter) grizzled black, brown, and white, producing general effect of dark gray; tail faintly bicolor, dusky and buffy; underparts dull fulvous to dark buffy. Total length, 6.5 inches; tail vertebræ, 1.3 inches; hind foot, .74 inch. Found in "Coast prairie of southwestern Louisiana, in Lower Austral Zone." (Bailey)

Hayden Meadow Mouse; Western Upland Mouse.—*Microtus haydeni* (Baird).

Larger and lighter colored than *ochrogaster*. Upperparts (summer) light gray, grizzled whitish and blackish; feet dusky gray; tail bicolor, dusky and whitish; underparts, silvery white to soiled whitish or light buff. Total length, 7.2 inches; tail vertebræ, 1.9 inches; hind foot, .88 inch. Found in "Plains region of western South Dakota, Nebraska, and Kansas, eastern Colorado and Wyoming, and southern Montana, in Transition Zone." (Bailey)

Least Meadow Mouse; Little Upland Mouse.—*Microtus minor* (Merriam).

Size very small, with a rudimentary sixth tubercle on sole of hind foot. Upperparts (winter) gray, grizzled black and whitish; feet gray; tail bicolor, dusky and buffy; underparts soiled whitish to pale buffy. Summer pelage mixed with fulvous above; underparts darker. Total length, 5.2 inches; tail vertebræ, 1.2 inches; hind foot, .66 inch. Found on "Northern border of the Great Plains from northeastern North Dakota to Edmonton, Alberta, and southeastward to Minneapolis, Minn." (Bailey)

Subgenus *Chilotus*

Characterized by presence of five plantar tubercles; small ears; fur close and dense without stiff hairs; side glands absent or obscure.

Oregon Meadow Mouse.—*Microtus oregoni oregoni* (Bachman).

Size small; tail long; fur short. Upperparts grizzled bister and blackish; ears rising above fur, blackish; feet dark gray; tail blackish above, slightly lighter below; underparts dark gray washed with buffy. Total length, 5.6 inches; tail vertebræ, 1.6 inches; hind foot, .68 inch. Found in "Pacific coast region from northern California to Puget Sound." (Bailey)

Rainier Meadow Mouse.—*Microtus oregoni cantwelli* Taylor.
Larger than typical *oregoni*, slightly paler in color and with different skull characters. Upperparts (midsummer) buckthorn brown; underparts grayish. Total length, 6 inches; tail vertebræ, 1.7 inches; hind foot, .72 inch. Found in the vicinity of Mount Rainier, Washington (Chelan, Yakima, and Snohomish Counties).

Yolla Bolly Meadow Mouse.—*Microtus oregoni adocetus* Merriam.

Very much paler and larger than typical *oregoni*. Upperparts sepia to reddish sepia brown; tail above, dark brownish, below, paler; feet whitish; underparts dull buffy. Total length, 6.9 inches; tail vertebræ, 2 inches; hind foot, .84 inch. Found in only the Boreal Zone on the South Yolla Bolly Mountain, Tehama County, California.

Creeping Meadow Mouse.—*Microtus serpens* Merriam.

Largest of the subgenus *Chilotus*; tail short; dark in color. Upperparts (winter) uniform sooty gray; sides lighter; feet dark gray; ears concealed in long fur; tail above, sooty, below, silvery gray; underparts dark gray washed with buff. Summer pelage paler and browner. Total length, 5.2 inches; tail vertebræ, 1.2 inches; hind foot, .72 inch. Found in "Low country of southern British Columbia and northern Washington between the Cascade Mountains and Puget Sound." (Bailey)

Baird Meadow Mouse.—*Microtus bairdi* Merriam.

Smaller than *oregoni*; tail short; pelage short and glossy; ears nearly hidden in fur. Upperparts glossy yellowish bister, paler on sides; nose dusky; feet dark gray; tail faintly bicolor, dusky and dark gray; underparts washed with whitish. Total length, 5.2 inches; tail vertebræ, 1.3 inches; hind foot, .70 inch. Found only on Glacier Peak, Crater Lake, Oregon.

* * * * *

The Meadow Mouse is one of the commonest of our small mammals and in one of its many varying forms is found throughout practically the entire extent of North America from the Barren Grounds southward. So adaptable to different environments is this small rodent that we find Meadow Mice living under all conditions, from swamp lands to dry, semibarren plains, and from sea-level up to the summits of high mountain ranges. In size and color there is a corresponding range of variation associated with the diversity of habitat.

Probably the best known members of the genus are the forms of the *pennsylvanicus* group, which live in meadows and grass-lands, usually in considerable numbers, and denote

their presence by well-defined runways through the grass. These Mice may be anywhere, provided there is sufficient grass and low-growing foliage for food and cover, but the best places to look for them are the extensive growths of rank, heavy grass where there is sufficient moisture to maintain a meadow the year around. Here *Microtus* is found in large colonies and the runways may be traced for long distances.

These runways are easily recognized as the highways of small mammals. To form them the Mouse cuts and deflects the grass to form a clear passage or tunnel, and the floor is kept clean of obstructions. Characteristic pellets, the mouse droppings, are a feature of the runways, and are usually concentrated at intervals, often near the mouth of a burrow. Here and there along the runways are holes leading down to subterranean burrows and runways where the animals have their nests. Often the runways make an obvious use of the natural features of the terrain and extend along the sides of logs, the lower rails of fences, etc. While most of the activities of the colony are centered about the runways, individuals may be trapped where there are no runways, showing that the Mice are not entirely dependent upon them.

The runways afford shelter from enemies and Meadow Mice are more or less active throughout the day. One frequently sees a Mouse darting along these tunnels in the grass, and during haying time numbers are caught above ground. Some species have grass nests for summer occupancy at the surface or beneath flat rocks, pieces of bark, boards, etc. Most of these Mice, however, retreat underground when not feeding. Probably Meadow Mice are most active at night, even in the case of those species which are seen during the daytime, for traps seem to catch the most between the hours of sunset and sunrise.

The forms of the *pennsylvanicus* group have a very wide geographical distribution, but nearly everywhere throughout this range the preferred environment for *pennsylvanicus* and its relatives is heavy grass-lands. The forms of most of the other groups of species in the subgenus *Microtus* may be sought in a like environment. The high-altitude species like *nanus* live in beautiful mountain meadows and parks, and some of the mountain species go above the tree limit and are found in

MEADOW MOUSE

the zone of dwarfed plants and thick mosses. The large *townsendii* is abundant in the luxuriant river-bottom meadows along the Willamette and Columbia rivers. Some of the forms of *californicus* are found in regions of scanty rainfall, but one must locate grass-land near streams before the Mouse can be encountered in any abundance.

In the forests of the Rocky Mountains and other ranges species such as *mordax* may be encountered in scattered localities where there are no meadows, and the Mice live in the same situations as the White-footed Mice, under logs and rocks. I have never encountered large colonies under these conditions, however.

The large members of the subgenus *Aulacomys*, living in the higher zones of the Rocky and Cascade Mountains and in Alberta, are not as abundant, if my experience with *macropus* may be taken as a criterion, as the forms of the subgenus *Microtus*. They are found about cold mountain streams and are large enough to pull out of the average mouse-trap.

On the open plains region east of the Rocky Mountains, and on the sagebrush plains between these mountains and the Cascade-Sierra system, one finds the Meadow Mice of the subgenus *Pedomys* (*Microtus*) and genus *Lagurus*. Some of these Mice are rare and very local, found only in small, scattered colonies. Throughout most of this territory the commoner species of the other groups of Meadow Mice are found as well.

The Meadow Mice of the subgenus *Chilotus* are more subterranean in habit than their relatives. *Microtus oregoni oregoni*, the only species of this group I have observed, makes small runways just under the surface of the ground, under the sod, and seldom comes out on top of the ground. During several years of trapping in a region where they are found, the only specimens taken were caught in traps set in these subterranean paths. The close thick pelage of these Mice is another indication of a highly modified, subterranean existence.

Meadow Mice are very prolific and wherever conditions are favorable doubtless have several litters of young annually. The number of young to a birth varies somewhat with the group and the subgenus, but is probably from four to eight. Plagues of Meadow Mice have been recorded both in the

Old and New Worlds, and after a season or two of unusually favorable food conditions the numbers of these Mice may be swelled to an unbelievable extent. Some of the species are very destructive to crops, not only to grain and pastures, but to orchards. Although the Mice are the favorite prey of a host of enemies, they are well able to hold their own or under favorable food conditions to far exceed the normal status.

Meadow Mice do not hibernate but are active summer and winter. With the melting of snow in the spring there often is disclosed the traces of activity which went on under the protecting white mantle.

Genus *Lagurus*¹

Very similar to the genus *Microtus* of which it was formerly a subgenus. Characterized by presence of five plantar tubercles; glands on flanks; very short tail; pale coloration; lax fur.

Subgenus *Lemmiscus*

Short-tailed Meadow Mouse.—*Lagurus curtatus curtatus* (Cope).

"Tail very short; feet hairy; fur long and lax; color pale buffy gray." (Bailey) Upperparts (winter) pale buffy gray to ashy gray; sides paler; ears tinged with buff; feet soiled whitish; tail soiled whitish, with faint dusky dorsal line; underparts silvery white to soiled whitish. Summer pelage slightly darker. Total length, 5.6 inches; tail vertebræ, 1.1 inches; hind foot, .70 inch. Found in "Transition Zone of the low mountain ranges in western Nevada and eastern California east of the Sierra Nevada and north of Death Valley." (Bailey)

Sagebrush Meadow Mouse.—*Lagurus curtatus artemisiae* (Anthony).

Resembling typical *curtatus* in color but slightly smaller and differing in cranial characters. Upperparts pale gray lightly washed with brownish on crown and rump; base of tail and lower rump buffy; tail faintly bicolor, above like back, below, buffy white; ears blackish with a few buffy hairs at base; underparts silvery white. Total length, 5.1 inches; tail vertebræ, 1 inch; hind foot, .68 inch. Found on sagebrush plains of Malheur County, Oregon, in Upper Sonoran Zone; limits of range unknown.

¹ See footnote, page 415.

Intermediate Meadow Mouse.—*Lagurus intermedius* (Taylor).
Smaller than typical *curtatus*, slightly larger and paler than *pauperrimus*. Upperparts grayish, no buffy on ears and nose; underparts silvery white. Total length, 4.9 inches; tail vertebræ, 1 inch; hind foot, .68 inch. Found in the Transition Zone of the Pine Forest Mountains, Humboldt County, Nevada.

Pallid Meadow Mouse.—*Lagurus pallidus* (Merriam).
Paler and smaller than *curtatus*; the palest Meadow Mouse found in America. Upperparts pale buffy gray, tinged with buff on ears and nose; feet pale gray; tail dusky above, whitish below; underparts white to soiled whitish. Total length, 4.8 inches; tail vertebræ, .80 inch; hind foot, .74 inch. Found in "Transition prairies of western North Dakota, Montana, and as far north as Calgary, Alberta." (Bailey)

Pigmy Meadow Mouse.—*Lagurus pauperrimus* (Cooper).
Smallest form of the genus *Lagurus*; darker than *curtatus*. Upperparts (summer) buffy gray, lightly sprinkled with dusky; strong buffy tinge on nose and ears; feet pale buffy; tail with dusky dorsal line, buffy below; underparts pale buffy. Total length, 4.6 inches; tail vertebræ, .80 inch; hind foot, .64 inch. Found in "Eastern Washington and Oregon, central Idaho, and the north slope of the Uinta Mountains, Utah, in Transition Zone." (Bailey)

* * * * *

The habits of the members of the genus *Lagurus* are similar to those of other Meadow Mice; see page 433.

Genus *Pitymys*¹

This genus has been placed as a subgenus of *Microtus* by many authors and bears considerable resemblance to that genus. Forms of *Pitymys* are characterized by the presence of five plantar tubercles; very small ears; short tail; hip glands on adult males; pelage short, dense and glossy. Members of this genus are known as Pine Mice, have a mole-like appearance due to the close, fine fur, and are rather subterranean in habit. Plate XXX.

Pine Mouse.—*Pitymys pinetorum pinetorum* (LeConte).

"Size small; ears very small; tail short; fur short and fine; colors bright." (Bailey) Upperparts glossy bright russet brown; sides lighter; feet grayish brown; tail dark brown above, lighter below; underparts dusky, washed with brown.

¹See footnote, page 415.

Total length, 4.5 inches; tail vertebræ, .74 inch; hind foot, .62 inch. Found in "Georgia and the Carolinas." (Bailey)

Mole Pine Mouse.—*Pitymys pinetorum scalopsoides* (Audubon and Bachman).

Larger than typical *pinetorum*, darker and duller. Upperparts dull brownish chestnut sprinkled sparingly with dusky; sides paler; feet brownish gray; tail faintly bicolor, sooty and grayish; underparts washed with dull buff. Total length, 5 inches; tail vertebræ, .8 inch; hind foot, .65 inch. Found in "Southern New York and westward to Illinois, southward along the coast, blending into true *pinetorum*." (Bailey) Recorded also from Coscob, Connecticut.

Bluegrass Pine Mouse.—*Pitymys pinetorum auricularis* (Bailey).

Resembling typical *pinetorum* in size but ears larger. Upperparts glossy dark chestnut sprinkled with dusky; feet brownish; tail above and below, color of back; underparts washed with pale chestnut. Total length, 4.8 inches; tail vertebræ, .88 inch; hind foot, .64 inch. Found in "Northern Mississippi, Tennessee, Kentucky, and southern Indiana, or in a general way the region between the Allegheny Mountains and the Mississippi River, mainly in the Lower Austral Zone." (Bailey).

Woodland Pine Mouse.—*Pitymys nemoralis* (Bailey).

Size large for the group; ears relatively large; fur longer and coarser than in *pinetorum*. Upperparts dull chestnut sprinkled with blackish; sides paler; feet pale buffy to dusky; tail faintly bicolor, above like back, below like belly; underparts washed with bright cinnamon. Total length, 5.4 inches; tail vertebræ, 1.0 inch; hind foot, .72 inch. Found "West of the Mississippi River from central Arkansas north to Council Bluffs, Iowa." (Bailey)

Florida Pine Mouse.—*Pitymys parvulus* Howell.

Resembling typical *pinetorum* but paler and smaller. Upperparts tawny; sides and tail with tint of vinaceous cinnamon; feet flesh color; underparts dusky with faint wash of vinaceous cinnamon. Total length, 4.8 inches; tail vertebræ, .6 inch; hind foot, .56 inch. Found in the vicinity of Ocala, Marion County, Florida; limits of range unknown.

* * * * *

Pine Mice are Meadow Mice which have become rather more specialized for a subterranean life than their kindred. The close, glossy fur is suggestive of the pelage of the short-tailed Shrew, *Blarina*, and this character, together with the short tail, serves to distinguish Pine Mice from the common Meadow Mice.

ROUND-TAILED MUSKRAT

Pine Mice are found in forested and brushy areas, but not in densely timbered regions, seeming to prefer an environment where open patches alternate with stands of brush, shrubs, or trees. Their runways are not on the surface like those of the Meadow Mice, but are mole-like tunnels just below the surface of the ground. These tunnels are smaller than Mole runways but like them in distribution and relation to the surface. There are numerous openings to the surface of the ground through which the Mice can pass in search of food, but much of the food is obtained under the surface as roots and bulbs. Pine Mice often use Mole runways when these tunnels make contact with their own system.

Pine Mice are like the other Meadow Mice in their general habits, such as activity throughout the year, tendency to live in colonies, and fecundity. Several litters are raised in a year but the young number only from one to four, rather less than in *Microtus*.

Pine Mice are destructive to agriculture, especially to orchards, for their depredations are frequently not noticed until too late to save the trees, and because their presence is so well hidden by the earth or the snow.

Genus *Neofiber*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Round-tailed Muskrat; Florida Water Rat.—*Neofiber alleni* and subspecies

General Description.—Appearance that of a diminutive Muskrat, with a round tail. Pelage long and composed of glistening guard-hairs and short, soft underfur; fore and hind-feet not peculiar; plantar tubercles five in number; tail round; ears nearly hidden in fur.

Color.—Sexes colored alike; no marked seasonal variation.

Upperparts uniform dark brown; underparts whitish or tinged with buffy.

Measurements.—Total length, 13 inches; tail vertebræ, 5 inches; hind foot, 1.6 inches.

Geographical Distribution.—Florida.

Food.—Vegetation, such as grass, bark, and roots.

Enemies.—Hawks, Owls, Snakes, and small predatory mammals.

Species and Subspecies of the Genus *Neofiber*

Florida Water Rat.—*Neofiber alleni alleni* True.

As described. Found in northern and central Florida.

Everglade Water Rat.—*Neofiber alleni nigrescens* Howell.

Resembling typical *alleni* but less brown and more blackish on upperparts and more whitish (less buffy) below. Found in southern Florida.

* * * * *

The Round-tailed Muskrat seems to occupy a position intermediate between the Meadow Mice and the Muskrats,



FIG. 89. Round-tailed Muskrat

not only in size but, to a certain extent, in habits as well. It is not as aquatic as the Muskrat, although it is found about the edges of streams and swamps and builds platforms of grass stalks in shallow water upon which it sits to feed. Harper, in *The Mammals of the Okefinokee Swamp Region of Georgia*, page 361, writes:

"It is not quite confined to the prairies, for it probably enters the water courses, and it builds its nest occasionally at the bases of solitary cypresses or clumps of bushes in the prairies, which may be regarded as incipient 'heads.' However, it is *par excellence* a prairie species, with one of the most restricted habitat ranges of any Okefinokee mammal. It is not even found in all parts of the prairies. Where the water becomes too open, or the vegetation (especially sphagnum) too sparse,

ROUND-TAILED MUSKRAT

signs of its presence are lacking. On the other hand, where the prairies are so completely filled with sphagnum and other aquatic plants that little open water is left, and sometimes none at all is visible over considerable areas, there *Neofiber*

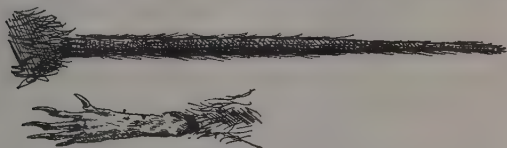


FIG. 90. Tail and hind foot of Round-tailed Muskrat

chooses its home. In fact it is perhaps more of a bog inhabitant than an aquatic animal. It progresses by runways over the surface of the bog, and by tunnels through the oozy muck. The latter must be constantly obstructed with the thick peaty sediment that tends to fill up every open space in the water of the prairie. Undoubtedly *Neofiber* also swims when it encounters water of sufficient depth. . . .

"The foundations of the nests rest on top of the sphagnum rather than in the water. Many of them are anchored about a turf of some of the larger prairie plants. . . . Some have a still more solid foundation, as at the base of a clump of buttonbushes, . . . or at the foot of a solitary young cypress that has invaded the edge of the prairie. The height of several nests, that were somewhat closely examined, varied from about 12 to 18 inches; the diameter, from 12 to 24 inches (and in one case about a yard). The fresh nests appear nearly globular; the older ones become somewhat depressed. . . .

"The chamber is just about large enough to enable the animal to turn around in it comfortably. Its floor is slightly elevated above the water level, and is usually damp or moist. There are invariably two entrances, or exits, on opposite sides of the chamber. . . .

"Among the other works of *Neofiber* are its feeding-stands, which one may find throughout its prairie haunts. These are essentially like the foundation of a nest, without the superstructure of vegetation. . . . They are slight, smooth-worn mounds of sphagnum, peat, herb stems, and the like.

with two tunnels leading downward into the bog on opposite sides. The distance between them here, as in the nests, is about 4 to 6 inches. Likewise the platform, as in the nests, rises barely above the water level. . . .

"Where the muck or the moss of the prairie rise close to or above the water level, runways are generally seen in the vicinity of the nests. They consist of more or less cleared passages, about 3 inches wide, that extend over the surface of the sphagnum and muck among fern, maiden cane, and the like. . . .

"From these meager data it appears that the breeding season extends from January at least to April, and very likely into the fall."

Genus *Ondatra* [=Fiber of various authors]¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Muskrat.—*Ondatra zibethica*

and related forms

Names.—Muskrat; Musquash. Plate XXVII.

General Description.—A large Rat with robust form; short legs; broad feet, specialized for swimming, hind feet partially webbed; tail long, laterally compressed, scaly and sparsely haired; ears scarcely showing above fur; pelage dense and composed of two types of hair, a close, waterproof underfur and longer, glistening guard-hairs; perineal glands strongly developed and secreting a pronounced musky odor; always living near water.

Color.—Sexes colored alike; Seasonal variation not conspicuous.

Upperparts.—Dark brown, slightly darker on head; sides chestnut; pelage glossy; underfur slate-colored at base.

Underparts.—Like pelage of sides, but washed with tawny and lighter in appearance, approaching whitish on throat and belly; a blackish spot on chin and blackish about wrists and heels; tail black; feet dark brown.

Paler and duller in worn pelage. Occasionally occurs in a black phase in which upperparts are black and underparts dark.

¹ For a full revision of the genus see N. Hollister, *North American Fauna*, No. 32, 1911.

MUSKRAT

Young duller in appearance, dusky on back, paler on sides.

Measurements.—Total length, 22.5 inches; tail vertebræ, 10 inches; hind foot, 3.2 inches; weight, 2 pounds.

Geographical Distribution.—Most of North America, south of the Barren Grounds.



FIG. 91. Muskrat

Food.—Mainly vegetation, chiefly aquatic plants, but sometimes traveling from water for other vegetation; animal food such as mussels, fish, and salamanders.

Enemies.—Hawks, Owls, Minks, Otters, Weasels, Foxes, Wolves; occasionally Pike and Pickerel.

Species and Subspecies of the Genus *Ondatra*.

Common Muskrat.—*Ondatra zibethica zibethica* (Linnæus).

As just described. Found in "Southeastern Canada, north-eastern and east central United States; from New Brunswick and Quebec west to Minnesota, and south to northern Georgia and Arkansas, except along the Atlantic seaboard south of Delaware Bay." (Hollister).

Virginia Muskrat.—*Ondatra zibethica macrodon* (Merriam).

Largest form of the genus, total length, 24.6 inches; hind-foot, 3.5 inches. Color lighter, brighter, and with less black than typical *zibethica*. Found in "Middle Atlantic

coast region of the United States, from Delaware Bay to Pamlico Sound; inland to Washington, Virginia, and Raleigh, N. C." (Hollister)

Labrador Muskrat.—*Ondatra zibethica aquilonia* (Bangs).

Much like typical *zibethica*, but slightly brighter and more richly colored. Found in "Labrador and Ungava." (Hollister)

Hudson Bay Muskrat.—*Ondatra zibethica alba* (Sabine).

Smaller than typical *zibethica*; total length, 21.6 inches; hind foot, 3 inches; paler in color above. Found in "Waters draining into Hudson Bay from the west, in eastern Saskatchewan and Keewatin; north to the Barren Grounds." (Hollister)

Northwestern Muskrat.—*Ondatra zibethica spatulata* (Osgood).

Small and dark. Total length, 21.2 inches; hind foot, 3 inches. Color above, glossy brown, sides russet, underparts whitish washed with cinnamon. Found in "Northwestern North America, from the Kowak River and Yukon Valley, Alaska, east to the Anderson River and south into British Columbia and Alberta." (Hollister)

Alaska Peninsula Muskrat.—*Ondatra zibethica zalopha* (Hollister).

Small, with short tail and small hind foot. Total length, 21.3 inches; tail vertebræ, 9.1 inches; hind foot, 2.8 inches. Color bister. Found in "Alaska Peninsula, north to Nushagak and east to the head of Cook Inlet." (Hollister)

Rocky Mountain Muskrat.—*Ondatra zibethica osoyoosensis* (Lord).

Like *spatulata* but larger; total length, 23.6 inches; hind foot, 3.3 inches. Color dark brown to blackish above. Found in "Puget Sound region and Rocky Mountains, from southern British Columbia, Washington, Idaho and western Montana, south in the mountains to northern New Mexico." (Hollister)

Oregon Coast Muskrat.—*Ondatra zibethica occipitalis* (Elliot).

Resembling *osoyoosensis* but paler and redder. Total length, 23.6 inches; tail vertebræ, 10.8 inches; hind foot, 3.3 inches. Found in "Northern Willamette Valley and coast of Oregon." (Hollister)

Nevada Muskrat.—*Ondatra zibethica mergens* (Hollister).

Large and pale. Total length, 22 inches; tail vertebræ, 10.1 inches; hind foot, 3.2 inches. Color above, grayish brown. Found in "Northern part of the Great Basin; southeastern Oregon, northeastern California, Nevada, and western Utah." (Hollister).

Arizona Muskrat.—*Ondatra zibethica pallida* (Mearns).

Small, rusty red, no long black hairs on back. Total length, 17.2 inches; tail vertebræ, 7.6 inches; hind foot, 2.6 inches. Found in "Colorado River valley (California, Lower California, and Arizona), east to the Rio Grande Valley in New Mexico." (Hollister).

FIG. 92. Distribution of the species and subspecies of *Ondatra*, after Hollister

1. *Ondatra zibethica zibethica*
2. *Ondatra zibethica macrodon*
3. *Ondatra zibethica aquilonia*
4. *Ondatra zibethica alba*
5. *Ondatra zibethica spatulata*
6. *Ondatra zibethica zolophia*
7. *Ondatra zibethica osoyoosensis*
8. *Ondatra zibethica occipitalis*
9. *Ondatra zibethica mergens*
10. *Ondatra zibethica pallida*
11. *Ondatra zibethica ripensis*
12. *Ondatra zibethica cinnamomina*
13. *Ondatra rivalicia*
14. *Ondatra obscura*



Pecos Muskrat.—*Ondatra zibethica ripensis* (Bailey).

Size of *pallida*, with shorter tail and darker pelage. Upperparts Vandyke brown. Found in "Pecos Valley, in Texas and New Mexico." (Hollister)

Great Plains Muskrat.—*Ondatra zibethica cinnamomina* (Hollister).

Smaller than typical *zibethica*, pale in color, with cinnamon-brown upperparts. Total length, 20 inches; tail vertebræ, 9.6 inches; hind foot, 2.9 inches. Found in "Great central plains region of western United States and Canada; from Manitoba south to northern Texas; east to central Iowa and west to the Rocky Mountains." (Hollister)

Louisiana Muskrat.—*Ondatra rivalicia* (Bangs).

Smaller than *zibethica*, pelage duller, underparts darker. Total length, 21.9 inches; tail vertebræ, 9.3 inches; hind foot, 3.1 inches. Upperparts dark brownish black with little of the warm reddish tinge of the other forms. Found in "Coast region of Louisiana, north to northern Calcasieu, Pointe Coupee, and Tangipahoa parishes." (Hollister)

Newfoundland Muskrat.—*Ondatra obscura* (Bangs).

Small in size, with hind foot large in proportion, dark brown to almost black above. Total length, 20 inches; tail vertebræ, 9 inches; hind foot, 3 inches. Found in Newfoundland.

* * * * *

The Muskrat is a well-known American species familiar either in its proper identity or as Hudson Seal after it leaves the hands of the fur dresser. In the eyes of the fur trade the Muskrat has come to assume an importance that makes it one of the most valuable of our fur resources, when considered in the aggregate. Fortunately this rodent has such a wide distribution and is so prolific that the species can stand the heavy annual toll exacted of it.

The Muskrat, as might be expected from its aquatic specializations, is never found at any great distance from water, and is found in greatest abundance in regions of extensive marshes and waterways. Along the coasts it lives in the salt marshes, and in the interior ranges along all of the river-courses and lakes. As may be noted from the map, there are few areas in North America between the northern limit of tree growth and the Rio Grande where some form of the genus *Ondatra* may not be found. Even in regions of comparatively scanty rainfall, such as Arizona, this water-loving creature lives along such streams as exist.

While the Rats themselves are not so scarce or wary as to

be difficult of observation, to the casual observer they may be best known by the houses they build of rushes and other water-plants. These houses are built primarily as winter homes and the summer nest may be an inconspicuous form of grass. In some regions the animals make burrows into the banks and have their nests above the level of the water, but underground. Since the evidences of their presence are very obvious, it is a simple matter for the trapper to find places for his trap, and because the Rats enter a trap readily large catches are easily made.

The female Muskrat has several litters each year and the litters are large. Hollister gives (for Maryland) three to five litters annually and the number of young in a litter varying from three to twelve or more,—the average six or eight. An animal with such potentialities for increase in numbers might very well be a serious economic problem, except that its food habits and choice of environment seldom bring it into conflict with agricultural interests.

The principal items in its diet are roots, bulbs and foliage of aquatic plants, but occasionally it may visit truck-gardens or standing grain. It has been noted feeding on animal food such as fish and amphibians and it seems to be especially fond of fresh-water mussels.

One of the greatest causes of annoyance due to the presence of Muskrats is the holes they dig in ditch-banks, retaining dams, and earth structures, which lead to subsequent leaks or floods.

This Rat takes its name from the pronounced musky odor given off by a pair of perineal glands. While penetrating in character, this odor is not unpleasant. The Muskrat is closely related to the Meadow Mouse, and in many respects is only an enlarged and specialized edition of it; but the genus is peculiar in its general distribution, for it is found only in the New World, whereas the Meadow Mice occur throughout the Northern Hemisphere.

Muskrat fur owes its value to the presence of a close, soft undercoat which is normally concealed below the long, hard guard-hairs. It is this short pelage which makes a waterproof covering for the animal and which, when the long hairs have been plucked by the furrier, bears a superficial resemblance to the underfur of the Fur Seal. With such a

warm covering, the Muskrat has no fear of cold weather and does not hibernate, being active throughout the year.

Musk rats, when undisturbed, may be seen moving about at any hour, but the best times for observation are early in the morning and, more especially, just before sunset. They are expert swimmers and travel in the water in preference to running on the ground, although they may go overland to quite a distance for some favorite article of food. Still or slow-moving water is best suited to their mode of living, but I have seen a Muskrat in a swift, white-water, mountain creek in the autumn when, perhaps, it was seized with a wanderlust and was seeking a new home site.

Family **Muridæ**. Old World Rats and Mice

Form typically rat or mouse-like; molar teeth three on each side, crown pattern tuberculate (in species introduced into North America), tubercles arranged in three longitudinal rows.

Subfamily **Murinæ**. Introduced Rats and Mice

Characters as given under the Muridæ, no special modifications.

Genus **Mus**

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

House Mouse.—**Mus musculus musculus** Linnæus

Names.—House Mouse; Domestic Mouse; Common Mouse.

General Description.—A small Mouse with long tail, sparsely haired; pelage dull in color, no great contrast between upper and lower parts.

Color.—Sexes colored alike; no very noticeable seasonal variation.

Upperparts mixed yellowish brown and black; feet brownish; tail above, dusky, below slightly lighter; underparts ashy gray.

Measurements.—Total length, 6–6.5 inches; tail vertebræ, 3.0–3.5 inches; hind foot, .70–.75 inch.

Geographical Distribution.—Found almost everywhere in United States and Canada where settlements or commerce exist.

Food.—Almost omnivorous, but preferring grain and various vegetable products.

Enemies.—Snakes, Hawks, Owls, Weasels, Foxes, and all small carnivores; domestic Cats and Dogs.

Species and Subspecies of the Genus *Mus*.

Only the one species of this genus has established a foothold in North America. In Mexico this Mouse has apparently developed a distinct subspecies and it is possible that other distinct races may appear in other places as this species becomes a more integral part of our native fauna.

The House Mouse is too well known to require any extended remarks, but since it may be confused, under certain circumstances, with some of the native species of Mice, attention is directed to some of its distinguishing traits.

While this Mouse is more or less truly a "house" Mouse about large cities, and where a severe winter climate forces it to seek shelter, in many places it lives in the fields and waste places and may be trapped side by side with native species. From most of the common native Mice, *Mus* may be distinguished by the ashy underparts, dull color pattern, and long semi-naked tail. Meadow Mice, with a somewhat similar color pattern, have more robust bodies, longer, fuller pelage, and generally a shorter tail. White-footed Mice need not be confused with the House Mouse because of the much different color pattern. The Harvest Mice bear the closest resemblance to House Mice, and although these native Mice are usually smaller in size than an adult House Mouse, the resemblance may be quite marked. Harvest Mice are more slenderly built and have proportionally longer tails. An infallible test may be applied if one has the skull of the Mouse for examination. The molar teeth of the House Mouse, as well as the molars of the three following species of introduced Rats, have three longitudinal rows of tubercles along their crowns, distinguishable at all stages of wear (in worn teeth

showing as low ridges rather than distinct tubercles) and no Mouse or Rat native to North America has molars with these three rows.

Genus *Rattus*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16.

Norway Rat.—*Rattus norvegicus*

(Best known in literature as *Mus norvegicus*). Plate XXXIII.

Names.—Norway Rat; Common Rat; House Rat; Wharf Rat; Barn Rat; Gray Rat; Domestic Rat; Brown Rat.

General Description.—A good-sized Rat, with large, nearly naked, ears; long, semi-naked tail, with rather conspicuous



FIG. 93. Norway Rat

annulations; pelage somewhat coarse; brown or grayish above, ashy below.

Color.—Sexes colored alike, no noticeable seasonal variation.

Upperparts.—Grayish or brownish, with mixture of more or less black; feet grayish or whitish; tail not distinctly bi-color, dusky above, somewhat lighter below.

Underparts.—Grayish to soiled whitish; transition in color from sides to underparts gradual.

Immature pelage duller and grayer than adult.

Measurements.—Sexes of equal size. Total length, 15–16 inches; tail vertebræ, 7–8 inches; hind foot, 1.6–1.7 inches.

Geographical Distribution.—Found nearly everywhere men have settled.

Food.—Practically omnivorous: grain, green vegetation, meat, eggs, etc.

Enemies.—Snakes, Owls, Hawks, Weasels, Cats, Foxes, and most of the small carnivores; domestic Cats and Dogs.

Species and Subspecies of the Genus **Rattus**.

Subgenus **Rattus**

Norway Rat.—*Rattus norvegicus* (Erxleben).

As described above.

Subgenus **Epimys**

Black Rat.—*Rattus rattus rattus* (Linnaeus). Plate XXXIII. Smaller and more slender than *norvegicus*. Upperparts slate-colored to black, darker and more glossy along dorsal region; underparts somewhat lighter than above, slaty gray to almost black; tail long, slender, and with finer annulations than in *norvegicus*. Total length, 16.5 inches; tail vertebræ, 9 inches; hind foot, 1.5 inches; Found today in only a few localities, commonest in southern states, but formerly introduced over a wide territory. The Norway Rat has driven out the Black Rat in most places where the two species come into close contact. Occasionally the Black Rat is taken in New York City.

Roof Rat; Alexandrine Rat.—*Rattus rattus alexandrinus* (Geoffroy). Plate XXXIII.

About the size of typical *rattus* but much lighter in color. Upperparts reddish brown; underparts white, strongly suffused with yellowish; tail very long and finely annulated, colored above like back, lighter below. Total length, 17 inches; tail vertebræ, 9.5 inches; hind foot, 1.6 inches. Rare today in most of the states, but like the Black Rat it has been introduced over a wider range from which it has been driven by the Norway Rat. The Roof Rat intergrades with the Black Rat and sometimes specimens display characters of both forms, upperparts intermediate between black and reddish brown, and underparts yellowish.

* * * * *

The House Rat is the most thoroughly disliked of rodents and has earned a reputation which all too often is transferred to our much more attractive and less destructive native Rats. The introduced Rat frequently lives under filthy conditions, carries disease (the bubonic plague is borne by the rat-flea) and is such a destructive creature that the hand of man has been set against it from time immemorial.

The Norway Rat is aggressive and so easily adapts itself to varying conditions that today it has a cosmopolitan distribution, and drives out our native Rats wherever it meets them. Living in great numbers in all our large cities and water-fronts, it is also found widely spread over less inhabited districts, frequenting fields and bushy areas where it finds favorable conditions. The Norway Rat, with its coarsely annulated tail, harsh pelage, and ashy underparts, only superficially resembles any of our native species and should be easily distinguished from the Wood Rats (which it most resembles) upon a close examination.

The Black Rat and the Roof Rat are so rare in most places that they will not lead to confusion with native Rats. The color and texture of pelage (coarser than in the Wood Rats), and long, nearly naked tail, are the best field characters. In tropical America these two introduced Rats are quite common, but throughout most of the United States they have been driven out by the Norway Rat. These two Rats, especially the Roof Rat, are more attractive in appearance than the Norway Rat.

All three of the introduced Rats display in the three rows of tubercles on the molar crowns an unmistakable character of separation from all New World Rats.

Family **Aplodontiidae**. Mountain Beavers

Burrowing rodents of medium to large size; form robust; legs rather short; tail vestigial; feet with five toes; tibia and fibula distinct; skull massive, widened posteriorly, constricted interorbitally; molar teeth simple.

Genus **Aplodontia**¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{1}$; Molars, $\frac{3}{3}$ = 22.

Mountain Beaver.—**Aplodontia rufa**

and related forms

Names.—Mountain Beaver; Showtl; Sewellel; less frequently Mountain Boomer, Ground-hog, Woodchuck. Plate XX.

¹ For a full revision of this genus see Walter P. Taylor, University of California Publications, Zool., Vol. 17, pp. 435-504, 1918.

MOUNTAIN BEAVER

General Description.—A squirrel-like mammal of robust build; tail so short as to appear absent; eyes and ears small; head heavy and blunt; neck short; fossorial in habit and active



FIG. 94. Mountain Beaver

only at night, hence seldom seen; pelage dark in color, somewhat crisp in texture.

Color.—Sexes colored alike; no very great seasonal change of pelage.

Upperparts light ochraceous buff to light buff or vinaceous cinnamon, of quite uniform intensity, darkest along mid-dorsal region, with a sprinkling of black hairs; spot at base of ear white; underparts grayish, with brownish wash; pelage everywhere slate-colored at base.

Measurements.—Sexes of approximately equal size. Total length, 14 inches; tail so short as to be difficult of accurate measurement; hind foot, 2.2 inches.

Geographical Distribution.—Found only in narrow strip along western part of Pacific states.

Food.—Green vegetation such as foliage and branches of many species of plants, shrubs, small trees, and ferns.

Enemies.—"Weasels, skunks, of two genera, wild cats, mink, gray foxes, golden eagles, and great horned owls." (Taylor).

Species and Subspecies of the Genus *Aplodontia*.

Brown Mountain Beaver.—*Aplodontia rufa rufa* (Rafinesque). As described above. Found in "Neighborhood of the Columbia River, in western Oregon, interiorly on the Pacific side of the Cascades; thence southward in a belt of unknown width to Mount Mazama in southern Oregon and the Siskiyou-Trinity district in northern California; northward to Puget Sound and the Chilliwack-Sumas region in southwestern British Columbia. Altitudinal range, from sea level in the Puget Sound district to 6,500 feet in the Siskiyou-Trinity Mountains of northern California; zonal range, Transition and Canadian." (Taylor)

Olympic Mountain Beaver.—*Aplodontia rufa olympica* (Merriam).

"Above, in summer specimens, pinkish cinnamon to light ochraceous-buff, often with something of a grayish cast; the whole grizzled with more or less of an admixture of black hairs; head and face brownish or grayish; under parts grayish with a faint wash of pinkish buff or cinnamon-buff." (Taylor) Total length, 14 inches; hind foot, 2.0 inches. "Geographical Range.—Northwestern Washington, vicinity of Olympic Mountains, intergrading with *Aplodontia rufa rufa* in the vicinity of Steilacoom, southern Puget Sound." (Taylor)

Northern Mountain Beaver.—*Aplodontia rufa columbiana* (Taylor).

Upperparts varying in individuals from light pinkish cinnamon to pinkish cinnamon grizzled with blackish and sometimes a few whitish-tipped hairs; underparts faintly washed with brown over pale drab gray; males usually with irregular white patches on underparts. Total length, 17 inches. Found in "Vicinity of Hope, British Columbia, south in the Cascade Mountains of Washington; probably intergrading with *Aplodontia rufa rainieri* between the international boundary and Mount Rainier." (Taylor)

Mount Rainier Mountain Beaver.—*Aplodontia rufa rainieri* (Merriam).

Grayer than typical *rufa*, slightly larger. Upperparts light ochraceous buff, liberally sprinkled with blackish hairs which may be tipped with silvery white; back blacker than sides; underparts plumbeous, with whitish markings which are usually most conspicuous on throat. Total length, 15 inches; hind foot, 2.5 inches. Found only on Mount Rainier, Washington.

Pacific Mountain Beaver.—*Aplodontia rufa pacifica* (Merriam). Plate XXXIV.

With more gray on head than in *olympica* and more concentration of blackish on dorsal region. Upperparts cinnamon to pinkish cinnamon, thickly sprinkled with glossy

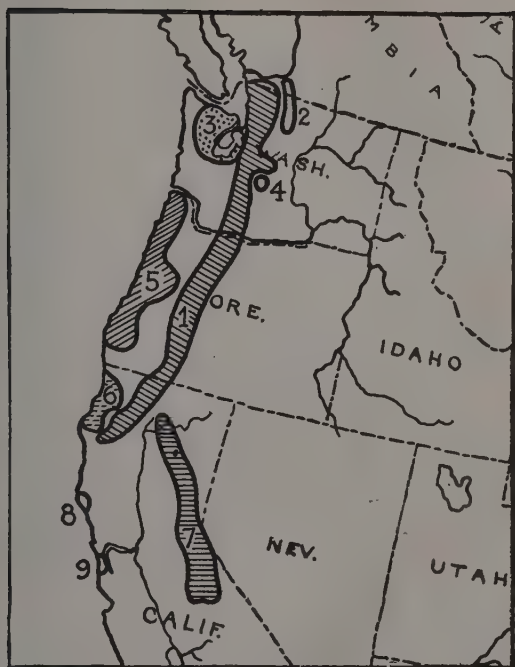


FIG. 95. Distribution of the subspecies of *Aplodontia rufa*, after Taylor

1. *Aplodontia rufa rufa*
2. *Aplodontia rufa columbiana*
3. *Aplodontia rufa olympica*
4. *Aplodontia rufa rainieri*
5. *Aplodontia rufa pacifica*
6. *Aplodontia rufa humboldtiana*
7. *Aplodontia rufa californica*
8. *Aplodontia rufa nigra*
9. *Aplodontia rufa phæa*

black, usually arranged in broad dorsal band; top of head black; face grayish; underparts grayish, lightly washed with brown. Total length, 13 inches; hind foot, 2.1 inches. Found on "Coast of Oregon, from Astoria on the north at least to Port Orford on the south; ranging inland locally, as in the vicinity of Eugene, Oregon, and gradually intergrading with *Aplodontia rufa rufa* probably in a broad belt centrally on the Pacific slope of Oregon from the northern to the southern boundaries of the state." (Taylor)

Humboldt Mountain Beaver.—*Aplodontia rufa humboldtiana* (Taylor).

"Larger and less richly colored than *Aplodontia rufa pacifica*." (Taylor) Upperparts light ochraceous buff to pinkish buff, uniformly sprinkled with black hairs and some silver-tipped hairs; underparts pale drab sprinkled with silvery white hairs, sometimes faintly washed with buffy brown; usually a white spot on lower abdomen. Total length, 13.8 inches; hind foot, 2.2 inches. Found in "The northern coast district of California from Humboldt Bay, Carlotta, and Cuddeback along the coast in Humboldt and Del Norte counties northward, at least to Requa; ranging inland locally in Humboldt County and intergrading with *A. r. rufa* in the vicinity of Weitzpek." (Taylor)

Sierra Mountain Beaver.—*Aplodontia rufa californica* (Peters).

Grayer than typical *rufa*. Upperparts pale ochraceous buff to ochraceous buff; uniformly sprinkled with black hairs and a few silvery-tipped hairs; spot at base of ear white; underparts light mouse-gray, lightly sprinkled with black hairs which may be tipped with silvery white, sometimes with faint brownish wash. Total length, 14 inches; hind foot, 2.2 inches. Found in "The Sierra Nevada of California, from Mt. Shasta on the north at least to Mammoth, Mono County, on the south. Zonal range, Boreal." (Taylor)

Point Arena Mountain Beaver.—*Aplodontia rufa nigra* (Taylor).

The darkest form of the genus. Upperparts shiny black, faintly sprinkled with pinkish buff hairs; sides paler than back, pinkish buff overlaid with black; underparts slate-colored, with light wash of pinkish buff. Total length, 13.8 inches; hind foot, 2.2 inches. Found only at Point Arena, Mendocino County, California." (Taylor)

Point Reyes Mountain Beaver.—*Aplodontia rufa phæa* (Merriam).

The smallest form of the genus. Upperparts pinkish cinnamon to cinnamon-buff (in winter sometimes grayish), uniformly grizzled with blackish; underparts slate-colored, with scattered sprinkling of black hairs, and washed with light ochraceous-buff to pinkish buff. Total length, 12.4 inches; hind foot, 2.1 inches. Found in "Favorable situa

tions in Marin County, California, where it is found within an area of approximately 110 square miles." (Taylor)

* * * * *

"Mountain Beaver" is somewhat of a misnomer for this animal which is not a true Beaver, but belongs to a separate and distinct family which is found only in North America, where it is restricted to a very small area. It is very primitive in structure.

The Mountain Beaver is so little known that no very acceptable vernacular name has appeared. It was first discovered by Lewis and Clark and was evidently well known to various western tribes of Indians, from whom we get the names, Sewellel (variously spelled), Showtl, Squallah, and others less euphonious. The name Mountain Beaver is used here because it is the one most apt to be remembered by the layman, and it has appeared sufficiently often in literature to have the sanction of usage.

This animal lives in extensive underground burrows and so seldom comes above ground in the daytime that one might live in the region frequented by *Aplodontia* and never suspect the presence of the animal. The burrows are usually in moist localities, sometimes with water running through them, and the openings are under ferns, bushes, or logs. The burrows are of generous size and run for long distances, with many openings. Vegetation cut for food is frequently left outside the burrow to wilt before being carried inside.

The Mountain Beaver is a very hardy animal, and although it fights viciously when first taken from a trap, becomes tame in a remarkably short time. The animal is strong enough to give a very painful bite. One that I kept allowed me to handle him freely before he had been captive twenty-four hours, and ate what I gave him without showing the timidity so often displayed by creatures just caught. He showed no fear of water and swam to shore in an unconcerned manner when I placed him in a small stream.

Mountain Beavers have a characteristic musky odor, penetrating but not unpleasant, reminiscent of that of a Muskrat. Their fur, while pleasing to the touch, has no commercial value.

The tail of the Mountain Beaver appears as scarcely more than a mere tuft of hairs, the vertebræ themselves being about

an inch and a half long, but part of this so included under the skin of the rump that the external tail seems very short.

Little is known of the breeding habits of this animal but it is believed that the young are born in June and number three to five.

Family **Zapodidæ**. Jumping Mice

Form mouse-like; hind legs and tail greatly elongated; internal cheek-pouches present; upper incisors narrow, grooved in front; crown surface of molars with complex, folded pattern; terrestrial in habit; gait saltatorial (when alarmed); soles of feet naked.

Subfamily **Zapodinæ**.

Genus **Zapus**¹

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{3}{3} = 18$.

Jumping Mouse.—**Zapus hudsonius**

and related forms

Names.—Jumping Mouse; Kangaroo Mouse. Plate XXX.

General Description.—A medium-sized Mouse with greatly elongated hind legs; very long, slender, tapering tail; short forelegs; ear not reaching much beyond surrounding pelage; color yellowish brown above, white below; pelage long and somewhat coarse when compared to that of the White-footed Mice or Meadow Mice; throughout most of its range hibernating in winter; when alarmed progressing by long leaps.

Color.—Sexes colored alike.

Upperparts (summer) mixed yellowish fawn and black, pelage slate-colored at base and only tips of hairs colored; a dark dorsal band from crown to base of tail where black-tipped hairs predominate; tail above, grayish brown, below, white, a sharp contrast between the two surfaces; feet white; underparts white, sometimes tinged with color encroachment from sides.

¹ For a revision of this genus see E. A. Preble, *North American Fauna*, No. 15, 1899.

JUMPING MOUSE

Winter pelage duller, yellower, and with less contrast between color of sides and dark dorsal band.

Immature pelage more ochraceous than adults, and more apt to show fulvous wash on underparts.



FIG. 96. Jumping Mouse

Measurements.—Sexes of equal size. Total length, 8.7 inches; tail vertebræ, 5.3 inches; hind foot, 1.2 inches.

Geographical Distribution.—Most of the United States and Canada north to Arctic Circle and south into California and into North Carolina.

Food.—Vegetation, seeds, and grains.

Enemies.—Hawks, Owls, Snakes, Weasels, Foxes, and other small carnivores.

Species and Subspecies of the Genus *Zapus*.

There is rather close agreement in color patterns throughout this genus; that is, the Jumping Mice all have a (more or less obvious) dark dorsal band, yellowish or ochraceous upperparts, and white underparts. Also, there is no very great seasonal variation, the winter pelage usually resembling that of summer, except for less contrast and a somewhat duller tone.

Hudson Bay Jumping Mouse.—*Zapus hudsonius hudsonius* (Zimmerman).

As described above. Found in suitable localities "from the southern shores of Hudson Bay south to New Jersey, and in the mountains to North Carolina, west to Iowa and Missouri, and northwest to Alaska." (Preble)

Labrador Jumping Mouse.—*Zapus hudsonius ladas* Bangs.

Large and darker than typical *hudsonius*. Upperparts

bright ochraceous buff, darkened by black-tipped hairs, dark dorsal band sprinkled with ochraceous; tail dusky above, white below, bicolor. Total length, 9.1 inches; tail vertebræ, 5.7 inches; hind foot, 1.3 inches. Found in "Eastern Quebec north to Hamilton Inlet, Labrador; limits of range unknown." (Preble)

Alaska Jumping Mouse.—*Zapus hudsonius alascensis* Merriam.

Resembling typical *hudsonius* but larger and darker. Upperparts dull dark ochraceous; dorsal band quite distinct, sprinkled with brownish; tail bicolor. Total length, 8.7 inches; tail vertebræ, 5.3 inches; hind foot, 1.26 inches. Found from "Yakutat Bay, north to Yukon River; limits of range unknown." (Preble)

Carolinian Jumping Mouse.—*Zapus hudsonius americanus* (Barton).

Smaller than typical *hudsonius* and dorsal band less distinct. Upperparts deep, dull ochraceous; dorsal band with only light admixture of black; ears dark, almost black; white underparts tinged with ochraceous. Total length, 7.8 inches; tail vertebræ, 4.6 inches; hind foot, 1.12 inches. Found "From vicinity of Raleigh, N. C., north through Upper Austral Zone along coastal plain to southern Connecticut and lower Hudson Valley, intergrading in upper edge of its range with *Z. hudsonius*." (Preble)

Prairie Jumping Mouse.—*Zapus hudsonius campestris* Preble.

Larger and brighter colored than typical *hudsonius*. Upperparts bright ochraceous buff, sprinkled with black; dorsal area well developed; tail above, dark grayish, below, yellowish white. Dorsal band and ears much darker in fall than in summer. Total length, 8.9 inches; tail vertebræ, 5.4 inches; hind foot, 1.2 inches. Found in "Great Plains from Manitoba southward to Nebraska and westward to Colorado and Wyoming." (Preble) Plate XXXI.

Kamloops Jumping Mouse.—*Zapus tenellus* Merriam.

Darker than typical *hudsonius*; larger in size; ears large. Upperparts (early fall pelage) olive-yellowish, thickly sprinkled with black; dorsal band not very well defined; tail sharply bicolor; dusky on nose, ears, and outer sides of legs. Total length, 8.3 inches; tail vertebræ, 5.1 inches; hind foot, 1.22 inches. Found only in vicinity of Kamloops, British Columbia.

Rocky Mountain Jumping Mouse.—*Zapus princeps princeps* Allen.

Larger than *hudsonius*. Upperparts yellowish brown, lightly sprinkled with blackish; dorsal band mixed pale yellowish brown and black; a clear yellowish brown lateral line separating white of underparts and darker color of sides; tail indistinctly bicolor, paler brown above, grayish white below; ears edged with yellowish white; underparts white, sometimes strongly tinged with ochraceous. Fall

pelage blacker along back and more yellow on sides. Total length, 9.8 inches; tail vertebræ, 5.9 inches; hind foot, 1.3 inches. Found in "Rocky Mountain region from northern New Mexico northward to Henry House, Alberta." (Preble)

Saskatchewan Jumping Mouse.—*Zapus princeps minor* Preble.

Smaller than typical *princeps*, dorsal band darker. Upperparts yellowish brown; dorsal band with heavy admixture of black; underparts tinged with salmon. Total length, 8.8 inches; tail vertebræ, 5.2 inches; hind foot, 1.2 inches. Found in "Plains of Saskatchewan." (Preble)

Blue Mountains Jumping Mouse.—*Zapus princeps oregonus* Preble.

Sides lighter colored than in typical *princeps*. Upperparts yellowish brown, sprinkled with black, less black along back and on head than in typical *princeps*; underparts clear white; ears distinctly edged with whitish. Total length, 10 inches; tail vertebræ, 6.0 inches; hind foot, 1.3 inches. Found in "Blue Mountains of Oregon." (Preble)

Warner Mountain Jumping Mouse.—*Zapus major* Preble.

Resembling *princeps* but larger. Upperparts ochraceous buff, sprinkled with black; tail indistinctly bicolor; feet dirty white; underparts whitish. Total length, 10.2 inches; tail vertebræ, 6.2 inches; hind foot, 1.4 inches. Found only in the Warner Mountains, Lake County, Oregon.

Nevada Jumping Mouse.—*Zapus nevadensis* Preble.

"Size rather large; color light." (Preble) Sides light ochraceous buff lightly sprinkled with black; dorsal band mixed pale yellowish brown and black; cheeks light-colored, almost white; underparts clear white. Total length, 9.8 inches; tail vertebræ, 6.0 inches; hind foot, 1.3 inches. Found only in the Ruby Mountains, Elko County, Nevada.

Northwest Jumping Mouse.—*Zapus trinotatus trinotatus* Rhoads.

Large in size; bright in color. Upperparts dark ochraceous buff, plentifully sprinkled with black; dorsal band well defined, mixed black and dark ochraceous buff; tail sharply bicolor, dusky brown and yellowish white; outer sides of legs dusky; underparts white, frequently marked with fulvous. Total length, 9.9 inches; tail vertebræ, 6.1 inches; hind foot, 1.34 inches. Found in "Coast region of southern British Columbia, Washington (including Cascades), Oregon (west of western base of Cascades), and northern California, south to Humboldt Bay." (Preble)

Allen Jumping Mouse.—*Zapus trinotatus alleni* (Elliot).

Paler than typical *trinotatus*. Upperparts pale ochraceous buff interspersed with black; dorsal band distinctly lighter in tone than in typical *trinotatus*; tail light grayish brown above, yellowish white below, often tipped with white; underparts white, without any fulvous. Total length, 9.6 inches; tail vertebræ, 6.0 inches; hind foot, 1.3 inches.

Found on "Mount Shasta and southward in the Sierra Nevada to Mammoth and North Fork of Kern River, California." (Preble)

Humboldt Jumping Mouse.—*Zapus trinotatus eureka* A. B. Howell.

Resembling typical *trinotatus* but with less conspicuous dorsal band. Upperparts (fall) tawny olive, with little difference between dorsal area and sides; tail sharply bicolor; underparts white, washed with tawny olive. Total length, 9.2 inches; tail vertebræ, 5.6 inches; hind feet, 1.32 inches. Found in "Northwestern coast region of California, from Mendocino City, Mendocino County, north at least through Humboldt County." (Howell)

Yellow Jumping Mouse.—*Zapus luteus luteus* Miller.

Resembling *alleni* but brighter and more ochraceous. Upperparts ochraceous buff; dorsal band not well defined. Total length, 9 inches; tail vertebræ, 5.5 inches; hind foot, 1.28 inches. Found in New Mexico, in Otero, Santa Fe, and Taos Counties.

Southern Jumping Mouse.—*Zapus luteus australis* Bailey.

Small and slender; colors pale. "Upperparts pale buffy yellowish sparingly lined with black hairs; back slightly darker but with poorly defined dorsal area; lower-parts pure white; heels dusky; feet white." (Bailey) Total length, 8.2 inches; tail vertebræ, 5 inches; hind foot, 1.2 inches. Found in Socorro County, New Mexico.

Mountain Jumping Mouse.—*Zapus montanus* (Merriam).

"Smaller and duller in color than *Z. trinotatus*." (Preble) Sides dark ochraceous buff, sprinkled heavily with black; well-defined dorsal area of mixed dusky and yellowish; tail sharply bicolor, dark gray and whitish; outer side of hind legs dusky; feet dirty white; underparts white. Total length, 9.1 inches; tail vertebræ, 5.4 inches; hind foot, 1.24 inches. Found in "Cascade Range in Oregon." (Preble)

Coast Jumping Mouse.—*Zapus orarius* Preble.

Dorsal area not sharply differentiated in color of sides. Upperparts dark ochraceous, sprinkled with black; dorsal area not well defined and with much the same tone as sides; ochraceous on hind legs; feet yellowish white; tail above, yellowish white, below, grayish; underparts white, heavily washed with ochraceous, color deepest on sides of throat. Total length, 8.8 inches; tail vertebræ, 5.1 inches; hind foot, 1.24 inches. Found on "Coast of California from Point Reyes north to Mad River, Humboldt County; limits of range unknown." (Preble)

Pacific Jumping Mouse.—*Zapus pacificus* Merriam.

Dorsal area not well differentiated. Sides buffy yellow, sprinkled with black; dorsal area mixed yellowish and black, the former predominating; tail sharply bicolor, grayish on upper, white on lower side. Total length, 9 inches; tail vertebræ, 5.6 inches; hind foot, 1.24 inches. Found in

"Interior valleys of southwestern Oregon and northwestern California; limits of range unknown." (Preble)

Stickeen Jumping Mouse.—*Zapus saltator* Allen.

Resembling *trinotatus* in color but smaller. Upperparts (fall) yellowish, sprinkled with black; dorsal band well defined, yellowish, plentifully mixed with black; ears edged with yellowish; tail dusky above, gray below; underparts clear white. Total length, 9.8 inches; tail vertebræ, 5.6 inches; hind foot, 1.28 inches. Found along "Telegraph Creek south to mouth of Skeena River and Tschimshian Peninsula; limits of range unknown." (Preble)

Genus *Napæozapus*

Dentition: Incisors, $\frac{1}{2}$; Canines, $\frac{0}{0}$; Premolars, $\frac{0}{0}$; Molars, $\frac{3}{3}$ = 16

Distinguished from *Zapus* by absence of one tooth in each upper jaw (premolar) and by the presence of a white tip on the tail; otherwise color pattern is as in *Zapus*.

Species and Subspecies of the Genus *Napæozapus*

Woodland Jumping Mouse.—*Napæozapus insignis insignis* (Miller).

"Size rather large, larger than *Zapus hudsonius*, with longer ears and paler, more fulvous coloration. Tail tipped with white." (Preble) Upperparts buff-yellow, lightly sprinkled with black, bristly hairs; color clearer on cheeks, neck, and narrow lateral line; dorsal band with black predominating, well defined; tail sharply bicolor, dark brown above, white below, tip white above and below; feet white; underparts white. Total length, 9.5 inches; tail vertebræ 5.8 inches; hind foot, 1.24 inches. Found in "Canadian Zone in eastern Canada and south to western Maryland." (Preble)

Roan Mountain Jumping Mouse.—*Napæozapus insignis roanensis* (Preble).

Smaller than typical *insignis* and darker. "Sides bright tawny ochraceous; entire upperparts, including ears, considerably darker than in typical *Z. insignis*. Beneath, pure white; amount of white on tail averaging less than in *Z. insignis*." (Preble) Total length, 8.8 inches; tail vertebræ, 5.2 inches; hind foot, 1.24 inches. Found only on Roan Mountain, Mitchell County, North Carolina.

Northern Woodland Jumping Mouse.—*Napæozapus insignis abietorum* (Preble).

"Larger than typical *Z. insignis*, with shorter ears and peculiar skull. . . . Apparently not distinguishable from *Z. insignis*" in color. Total length, 10.2 inches; tail vertebræ, 6.4 inches; hind foot, 1.32 inches. Found "Probably

throughout Hudsonian Zone in eastern Canada; limits of range unknown." (Preble)

Jackson Jumping Mouse.—*Napæozapus insignis frutectanus* Jackson.

Resembling typical *insignis* in size but differing in color. Sides clay color sparingly mixed with black; dorsal band clay color with heavy mixture of black; ears edged with pinkish buff; nose and face dusky; tail bicolor, olive-brown and white, white tip nearly an inch long; underparts creamy white. Total length, 9.4 inches; tail vertebræ, 5.8 inches; hind foot, 1.24 inches. Found in Oneida and Oconto Counties, Wisconsin.

* * * * *

The Jumping Mouse is readily recognized by its long slender tail and tawny or ochraceous color. The only other rodents with such leaping modifications, namely, long hind legs and elongate tail, are the Pocket Rats which, as their name implies, may be known by their external cheek-pockets. In addition, these latter rodents are much larger and of such different structural and color characters that they should never be confused with Jumping Mice.

Jumping Mice are peculiar in several ways. They are erratic in distribution, more often rare than common and yet in some localities being encountered as fairly abundant. They hibernate (Plate XXXII.) during cold weather and prepare for this dormant period by putting on a heavy layer of fat. These Mice show a fondness for meadows and grassy spots, and may be started in the daytime when they leap away from a threatening foot step. The genus is distributed in forested sections and on the less arid plains, although it seems to be restricted to the brush and forest-bordered streams in the latter instance.

In structure the Jumping Mice are set far apart from the common rodents, the cricetines, and occupy a family position next to the Porcupines. The genus *Zapus* is restricted to North America, but *Napæozapus* is found in Asia as well.

The number of young is five or six and but one litter is raised in a season.

Family Erethizontidæ. American Porcupines

Large, robust rodents having quills or spines in their pelage, the spines loosely attached to the skin; toes four in front, five

behind, all with strong, curved claws; ears short; tibia and fibula distinct; mammæ four; molar crown pattern complex.

Genus *Erethizon*

Dentition: Incisors, $\frac{1}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{1}{1}$; Molars, $\frac{8}{8}$ = 20.

Porcupine.—*Erethizon dorsatum*

and related forms

Names.—Porcupine; Hedgehog (a misnomer, for the true Hedgehog is an insectivore); Quill-pig. Plates XXVII and XXXV.



FIG. 97. Porcupine

General Description.—A large, clumsy rodent with long, sharp spines in its pelage. Head proportionally small; muzzle blunt; lips hairy; body thick and heavy; limbs rather short; four claws on forefeet, five on hind feet; tail short, thick, muscular; pelage composed of fairly long, soft, woolly

hair with which is mixed much longer, hard, glistening hairs and long spines; spines stiff, sharp, and barbed, and occurring all over upperparts from crown of head and sides to end of tail; underparts spineless; gait plantigrade.

Color.—Sexes colored alike; no very marked seasonal variation.

Everywhere slaty black, or brownish black to black, liberally sprinkled on upperparts and sides with light-tipped hairs which are whitish to yellowish white; spines yellowish white

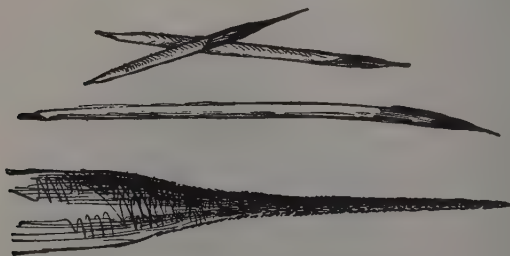


FIG. 98. Quills of Porcupine; lower figure greatly enlarged to show barbed tip

tipped with black; spines most conspicuous on rump and tail, more or less concealed elsewhere; incisors orange-red.

Immature like adults.

Measurements.—Sexes of equal size. Total length, 36–40 inches; tail vertebræ, 6 inches; hind foot, 3.5–4 inches; weight 15 to a maximum of 35 or 40 pounds when excessively fat.

Geographical Distribution.—Most of forested North America north of 40° and south in the Rocky Mountains almost to the Mexican boundary.

Food.—Bark, buds, and foliage of many trees, shrubs, and plants; in winter principally bark and small twigs of cottonwoods, willows, aspens, hemlocks, jackpines, elms, basswood, etc.; very fond of salt.

Enemies.—Well equipped to protect itself against most enemies, but said to be preyed upon by the Fisher.

Species and Subspecies of the Genus **Erethizon**

Canada Porcupine.—*Erethizon dorsatum dorsatum* (Linnæus).
As described. Found from Nova Scotia south through Pennsylvania in the mountains, westward in forests through the Great Lakes district and northwestward to the Arctic Circle. Plate XXXV.

Labrador Porcupine.—*Erethizon dorsatum picinum* Bangs.
Like typical *dorsatum* but lacking the light-tipped hairs; incisors dull yellow rather than orange. Color jet black to brownish black, yellow-tipped hairs found only on rump and sides of tail and then only sparingly. Total length, 32 inches; tail vertebræ, 7 inches; hind foot, 4 inches. Found in Labrador.

Yellow-haired Porcupine.—*Erethizon epixanthum epixanthum* Brandt.

Resembling *dorsatum* but colored differently; long hairs tipped with greenish yellow. Total length, 32 inches; tail vertebræ, 6.5 inches; hind foot, 4.2 inches. Found from Utah and Colorado northward through forested country to Alaska; known as far east as North Dakota; south in the Cascade mountains into California, and down the Sierra Nevadas to about Mt. Whitney.

Nebraska Yellow-haired Porcupine.—*Erethizon epixanthum bruneri* Swenk.

"Similar to *E. epixanthum epixanthum* Brandt, of California, but slightly larger, with the hind feet comparatively shorter, the general coloration paler and duller, the under side of the tail largely or wholly brownish yellow. . . ."
(Swenk) Total length, 34 inches; tail vertebræ, 8 inches; hind foot, 4 inches. Found in forested areas in Nebraska; limits of range unknown but recorded from Wyoming, Montana, and Kansas.

Arizona Porcupine.—*Erethizon epixanthum couesi* Mearns.

Smaller and less yellow than typical *epixanthum*; ears larger; quills tipped with brown; long hairs tipped with whitish; brownish on muzzle, feet, and underparts. Found in Arizona (Yavapai County); limits of range unknown.

Dusky Porcupine.—*Erethizon epixanthum nigrescens* Allen.

Yellow tipping of long hairs paler than in typical *epixanthum* and general coloration darker; pelage, exclusive of spines and light tips of hairs, sooty black. Total length, 30 inches; tail vertebræ, 8.2 inches; hind foot, 3.6 inches. Found in British Columbia in the region of Telegraph Creek, Level Mountains and Shesley River; limits of range unknown.

Alaska Porcupine.—*Erethizon epixanthum myops* Merriam.

"Similar to *E. epixanthum* but tail and hind feet shorter; body, flanks and sides of tail even yellower; face whiter from more abundant admixture of yellowish white hairs on sides of face and between eyes, so that the fore part of head appears almost grayish instead of sooty." (Merriam)

Total length, 26.5 inches; tail vertebræ, 8 inches; hind foot, 3.5 inches. Found on the Alaska Peninsula; limits of range unknown.

* * * * *

The Porcupine is a big, clumsy, slow-moving rodent so characteristic in appearance that it may be recognized as far as it can be seen. Secure in its defense of sharp quills, it does not need to be fleet of foot and can be easily approached when encountered. Although the Porcupine usually makes some effort to get out of the way of man, it relies upon its quills if crowded, and with head down and quills erected waits for any offensive move.

When not aroused, the quills may often be fairly well hidden in the long, coarse pelage, but when alarmed, the animal has the faculty of erecting the quills so that they stand out at a steep angle from the body, especially along the lower back. The thick, muscular tail is an effective weapon of offense and with it the Porcupine delivers such a quick slap that a too-inquisitive Dog will have its face driven full of quills, if it comes up to a waiting Porcupine. The story of Porcupines shooting quills is a pure myth and perhaps arose from the fact that the animal is able to reach out and drive quills home with a slap of the tail. Quills may be shaken loose if a Porcupine is disturbed, but they are not cast voluntarily. Quite often, dislodged quills become lodged in the Porcupine itself after a violent encounter with some enemy, but these presumably cause no trouble to the Porcupine.

On the other hand, any animal that deliberately attacks a Porcupine which is in a posture of defense, nose drawn in and belly to the ground, can hardly escape injuries which are likely to prove fatal. The quills have tiny barbs and once bedded in flesh tend to work inward. Quills in the head, throat, or chest eventually pierce a vital spot and it is practically impossible for a wild animal to pull a quill out. In fact, it is no easy matter for a man to pull them out of a Dog, and it takes a good tug to draw out a quill that has been set in by the tail of the Porcupine. The base of the quill is but loosely fastened in the skin of the big rodent and any slight pressure against an enemy is sufficient to transfer the sharp spine from the Porcupine to the attacker.

In temperament the Porcupine appears to be dull, stupid, and

PORCUPINE

surly, and not very social toward his own kind. He has an inordinate desire for salt and frequently comes to grief because of this fact. When one of these animals invades a camp he will gnaw at anything that will yield the slightest trace of salt. The perspiration which has dried on a shovel or pick handle makes this wood a delicacy for the Porcupine and he will chew it up; soapy water thrown out on the ground or against a stump makes that spot have an irresistible attraction. Aside from the damage done by the capable teeth of this rodent, there is the possible danger of stumbling over the prowler after dusk and the Porcupine is not a popular visitor.

In some parts of the country the Porcupine has earned protection because of the fact that this animal may prove the salvation of any one lost in the woods. It is the one mammal which an unarmed man may easily kill and its flesh, while not a delicacy, is a substantial article of diet under such circumstances. Porcupines may kill trees by removing too much bark or by girdling, but in most places their depredations do not assume very great economic importance. They are fairly good swimmers and take to the water without hesitation if they wish to cross a stream or narrow body of water.

The Porcupine has one to four young (usually one or two) at a birth and but one litter a year.

They do not hibernate but are active in all weathers. Although clumsy in build they are excellent climbers and spend a good part of their existence in trees. They can climb out on comparatively small branches and up into light brush as well as up good-sized trees. If allowed to do so, a Porcupine disturbed on the ground will try to climb the first tree at hand.



Order LAGOMORPHA. HARES, RABBITS, and PIKAS

Resembling the Rodentia but upper incisors four in number; a large functional pair with enamel extending to posterior face of tooth (as contrasted to enamel restricted to anterior face of tooth in the Rodentia), and a small pair without cutting edges directly behind them; upper and lower jaws opposing each other only one side at a time and motion of mastication lateral in consequence; bony palate very narrow from front to back; tail short to very short; habit terrestrial.

Family Ochotonidæ. Pikas

Size small; ears broad and rounded, small as compared to the Leporidæ; no visible, external tail; legs rather short and hind legs not much longer than forelegs; feet digitigrade; toes five in front, four behind; upper incisors deeply grooved in front.

Genus *Ochotona*.¹ Pikas or Conies

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{2}{2}$; Molars, $\frac{3}{3}$ = 26

Pika.—*Ochotona princeps*

and related forms

Names.—Rocky Mountain Pika; Rocky Mountain Cony; Rocky Mountain Rock-rabbit; Little Chief Hare. Plate XXXVI.

General Description.—Body robust; tail so short as to be practically non-existent; legs short and hind legs but little longer than forelegs; five toes on forefeet, four on hind feet, a naked pad at base of each toe, palms and soles densely

¹ For a full and up-to-date revision of this genus see A. H. Howell, *North American Fauna*, No. 47, 1924.

haired; eyes fair sized, but relatively much smaller than in the Hares; ears rounded, of good size, haired inside as well as outside; fur soft, lax, and dense. The voice of the Pika, an indescribable "bleat," is like the call of no other mammal and identifies the creature unmistakably.

Color.—Sexes colored alike.

Upperparts.—Grayish or buffy, the hairs slate-colored at base, color variable with the individual and ranging from



FIG. 99. Pika

pinkish buff, clay color, or ochraceous tawny to a fuscous or grayish mixture. Feet whitish to cinnamon-buff; ears brownish or blackish; sides much like back.

Underparts.—Whitish, varying to cinnamon-buff; soles of feet buffy white, brownish, or fuscous.

Summer pelage more richly colored with tawny or ochraceous than winter pelage.

Pikas molt twice annually (except for *Ochotona collaris*), and there is generally a well-marked line between the fresh and the worn pelage. The new pelage appears first on the head and progresses evenly backward, replacing the old pelage last on the underparts.

Measurements.—No noticeable differences between males and females. Total length, 7.6 inches; hind foot, 1.2 inches.

Geographical Distribution.—Rocky Mountain region.

Food.—Vegetation; leaves, flowers, stems of many species of plants; much of this is sun dried to make "hay." Among other species the following plants have been noted in the "hay-stacks"—nettles, chokecherry, currant, gooseberry, raspberry, lupine, aspen, goldenrod, fireweed, huckleberry, elderberry, and grasses.

Species and Subspecies of the Genus *Ochotona*

Subgenus *Pika*

Rocky Mountain Pika.—*Ochotona princeps princeps* (Richardson).

As described above. Found in "Rocky Mountains, from eastern British Columbia (headwaters South Pine River) and western Alberta (Muskeg Creek) south along the main divide to eastern Idaho and western Montana (Bitterroot Mountains)." (Howell)

Alberta Pika.—*Ochotona princeps lutescens* Howell.

Like typical *princeps* but smaller; total length, 7.2 inches; hind foot, 1.2 inches. Coloration paler. Found on "Mount Inglesmaldie (near Banff) and other mountains in Canadian National Park, Alberta, south to Mount Forget-me-not (50 to 75 miles southwest of Calgary)." (Howell)

Hollister Pika.—*Ochotona princeps levis* (Hollister).

Paler than typical *princeps*, darker than *lutescens*, size of *lutescens*; total length, 7.3 inches; hind foot, 1.2 inches. Found in "Mountains of southern Alberta and Montana (east of the main divide) from Waterton Lake to the Belt Mountains." (Howell)

Lemhi Pika.—*Ochotona princeps lemhi* (Howell).

Small, pale, and with narrow braincase. Total length, 7.2 inches; hind foot, 1.2 inches. Found in "Mountains of south-central Idaho—the Lemhi, Lost River, Salmon River, and Sawtooth Ranges; eastward to the Beaverhead Mountains, east of Leadore; northern limits of range imperfectly known." (Howell)

Wyoming Pika.—*Ochotona princeps ventorum* (Howell).

Like typical *princeps*, but summer pelage more buffy and with less blackish mixture; darker than *levis*; total length, 8 inches; hind foot, 1.25 inches. Found in "Wind River, Gros Ventre, Absaroka, and Teton Ranges, Wyoming, north to the Beartooth and Absaroka Ranges in southern Montana." (Howell)

Uinta Pika.—*Ochotona princeps uinta* (Hollister).

Similar to *ventorum* but more buffy in coloration; total length, 8.2 inches; hind foot, 1.2 inches. Found in "The Uinta and Wasatch Ranges, in Utah, and the Salt River and Wyoming Ranges, in western Wyoming." (Howell)

Ruby Mountains Pika.—*Ochotona princeps nevadensis* (Howell).

Paler than *uinta*, which it most resembles; total length, 8 inches; hind foot, 1.25 inches. "Known only from Ruby Mountains, Nevada." (Howell)

Figgins Pika.—*Ochotona princeps figginsi* (Allen). Plate XXXVII.

Grayer than *uinta* and with more blackish; total length, 7.6 inches; hind foot, 1.2 inches. Found in "Western Colorado, from Gunnison County north to eastern Routt

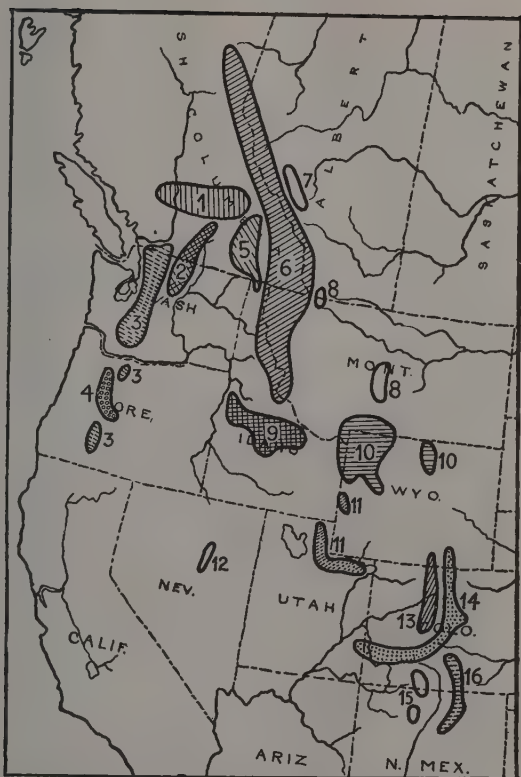


FIG. 100. Distribution of the subspecies of *Ochotona princeps*, after A. H. Howell

- | | |
|--|---|
| 1. <i>Ochotona princeps brooksi</i> | 9. <i>Ochotona princeps lemhi</i> |
| 2. <i>Ochotona princeps fenisex</i> | 10. <i>Ochotona princeps ventorum</i> |
| 3. <i>Ochotona princeps brunescens</i> | 11. <i>Ochotona princeps uinta</i> |
| 4. <i>Ochotona princeps fumosa</i> | 12. <i>Ochotona princeps nevadensis</i> |
| 5. <i>Ochotona princeps cuppes</i> | 13. <i>Ochotona princeps figginsi</i> |
| 6. <i>Ochotona princeps princeps</i> | 14. <i>Ochotona princeps saxatilis</i> |
| 7. <i>Ochotona princeps lutescens</i> | 15. <i>Ochotona princeps nigrescens</i> |
| 8. <i>Ochotona princeps levis</i> | 16. <i>Ochotona princeps incana</i> |

County (Hahn Peak) and to Bridger Peak, Wyoming." (Howell)

Colorado Pika.—*Ochotona princeps saxatilis* (Bangs).

Size large, total length, 8 inches; hind foot, 1.3 inches. Coloration "buffy-grayish." (Howell) Found in "Eastern mountain ranges of middle Colorado from the Medicine Bow Range south to the Sangre de Cristo Range; northward to Medicine Peak, Wyoming; westward in southern Colorado to the San Juan Range and to the La Sal Mountains in eastern Utah; altitudinal range approximately from 9,000 to 13,500 feet." (Howell)

New Mexico Pika.—*Ochotona princeps incana* (Howell).

Size of *saxatilis* but paler and less tawny; total length, 7.6 inches; hind foot, 1.2 inches. Found in "High mountains of northern New Mexico, from Pecos Baldy north to the Culebra Range and probably to Sierra Blanca, Colorado." (Howell)

Jemez Mountains Pika.—*Ochotona princeps nigrescens* (Bailey).

Size of *saxatilis* but darker and grayer; total length, 8 inches; hind foot, 1.2 inches. Found in "Jemez Mountains, New Mexico, north to the southern end of the San Juan Mountains, Colorado." (Howell)

Bangs Pika.—*Ochotona princeps cuppes* (Bangs).

Like typical *princeps* but darker; upperparts "suffused with ochraceous-tawny instead of cinnamon-buff." (Howell) Total length, 7.8 inches; hind foot, 1.2 inches. Found in "Southeastern British Columbia, northeastern Washington, and northern Idaho, from Glacier south to Cabinet Mountains; west to the Gold Range, British Columbia; exact limits unknown." (Howell)

Ashnola Pika.—*Ochotona princeps fenisex* (Osgood).

Resembling *cuppes* but paler and less ochraceous (summer); total length, 7.3 inches; hind foot, 1.25 inches. Found in "Interior mountain ranges of northern Washington and southern British Columbia from vicinity of Wenatchee, Washington, north to the upper end of Okanagan Lake." (Howell)

Shuswap Pika.—*Ochotona princeps brooksi* Howell.

Browner than *fenisex*, paler than *cuppes*; total length, 7.7 inches; hind foot, 1.25 inches. Found in "Interior of southern British Columbia from Shuswap Lake west to Mount McLean and McGillivray Creek, Lillooet District; limits of range unknown." (Howell)

Cascade Pika.—*Ochotona princeps brunnescens* (Howell).

Like *fenisex* but browner above and more buffy below, in winter pelage very much like *brooksi*; total length, 8 inches; hind foot, 1.3 inches. Found in "Cascade Range from southwestern British Columbia south to vicinity of Crater Lake, Oregon; interrupted apparently in central Oregon

(vicinity of Mount Jefferson and Three Sisters) by the range of *fumosa*." (Howell)

Dusky Pika.—*Ochotona princeps fumosa* (Howell).

Size of *brunnescens* (total length, 8 inches; hind foot, 1.3 inches), but upperparts blacker and less brown. Found on "Western slopes of the Cascade Mountains in Oregon, from the upper Clackamas River south at least to Three Sisters; also mountains near Paulina Lake, Crook County." (Howell)

Collared Pika.—*Ochotona collaris* (Nelson).

Like typical *princeps* in winter pelage but "coloration decidedly more grayish and less buffy, both above and below; a more or less distinct grayish patch on nape and shoulders." (Howell) Total length, 7.6 inches; hind foot, 1.2 inches. Found in "Central and southern Alaska and Yukon, from Mount McKinley and the Ogilvie Range south to Teslin Lake, British Columbia, and White Pass, Alaska." (Howell)

Gray-headed Pika.—*Ochotona schisticeps schisticeps* (Merriam).

"Head and shoulders smoke-gray, mixed with fuscous; rest of upperparts vinaceous-cinnamon, mixed with fuscous." (Howell), in winter. Total length, 7.5 inches; hind foot, 1.2 inches. Found in "Boreal Zones of the northern Sierra Nevada, from Mount Shasta south to Donner Pass; altitudinal range from about 5,000 feet (on Mill Creek, above Morgan, Tehama County) to at least 9,000 feet." (Howell)

Taylor Pika.—*Ochotona schisticeps taylori* (Grinnell).

Smaller than typical *schisticeps*, more blackish, especially on head. Total length, 7 inches; hind foot, 1.06 inches. Found in "Northeastern California and southern Oregon, from Madeline Plains north to Steens Mountains, Oregon, and west to Goose Nest Mountain, Siskiyou County, California; altitudinal range from 5,000 to 8,000 feet."

Lava-bed Pika.—*Ochotona schisticeps goldmani* Howell.

Resembling *taylori* but much darker in color, the darkest form of the genus; total length, 7.3 inches; hind foot 1.2 inches. "Known only from Echo Crater and Fissure Crater, Snake River Desert, Idaho." (Howell)

Blue Mountains Pika.—*Ochotona schisticeps jewetti* Howell.

Like typical *schisticeps* but paler in summer and slightly darker in winter, larger than *taylori*; total length, 7.3 inches; hind foot, 1.24 inches. Found in "Wallowa Mountains, Strawberry Mountains, and southern portion of Blue Mountains, northeastern Oregon; altitudinal range approximately from 5,000 to 10,000 feet." (Howell)

Yosemite Pika.—*Ochotona schisticeps muiri* Grinnell and Storer.

Resembling typical *schisticeps* but paler, with less fuscous suffusion on upperparts; total length, 7.5 inches; hind foot, 1.2 inches. Found in "Central portion of Sierra Nevada,

from Mount Tallac south to Mammoth Pass; altitudinal range, 7,800 to 12,800 feet." (Howell)

Mount Whitney Pika.—*Ochotona schisticeps albata* (Grinnell).
Paler than *muiri*, which it most closely resembles; the palest of the American Pikas; total length, 7.3 inches; hind foot, 1.2 inches. Found in "Southern part of the high Sierra Nevada, from Kearsarge Pass south to the headwaters of the Tule and Kern Rivers; altitudinal range from about 8,500 to 13,000 feet." (Howell)

White Mountain Pika.—*Ochotona schisticeps sheltoni* Grinnell.
Intermediate in color between typical *schisticeps* and *muiri*, size of *taylori*; total length, 7 inches; hind foot, 1.1 inches. Found in "The White Mountains of California and Nevada (8,000 to 13,000 feet altitude)." (Howell)

Beaver Mountains Pika.—*Ochotona schisticeps cinnamomea* (Allen).

Smaller than typical *schisticeps* (total length, 7.5 inches; hind foot, 1.14 inches); and paler on face, head, and nape (summer); more cinnamon on sides. Found in "Beaver Range, Utah, and Toyabe Mountains, Nevada; altitudinal range from 8,000 to 11,000 feet." (Howell)

Parawan Mountains Pika.—*Ochotona schisticeps fuscipes* Howell.

Like typical *schisticeps* (summer) but with darker soles and palms; total length, 8 inches; hind foot, 1.2 inches. Known only from type locality, Brian Head, Parawan Mountains, Iron County, Utah.

* * * * *

The Pikas are easily identified by their form—appearance that of a diminutive tailless Rabbit—their peculiar call, and by the fact that they make their home in the great masses of loose slide-rock. Sometimes an animal is seen away from the rock (I have known of one taking up an abode in the slab-pile of an old sawmill), but it is typically a creature of the piled-up debris of weathered cliffs, where sun and frost have cracked off blocks and slabs of all sizes. Such piles are to be found in greatest abundance in the upper elevations of the Rocky Mountains and the Pacific coast ranges, and usually the Pika is to be seen only at high elevations. There are exceptions to this rule, however, and Pikas are found on the Fraser River of British Columbia at elevations of a few hundred feet, and along the western slopes of the Cascades of Oregon as low as 900 feet altitude.

Pikas occur in Asia, but the family is northern in its distribution and does not range out of the northern part of the Northern Hemisphere.

Because of the protective coloration of these animals, they are not easily discovered unless on the move. When a person approaches slide-rock where Pikas dwell, he may be greeted by the peculiar squeaking "bleat," a call that baffles description, but which is so distinctive that, once heard, it may never be forgotten. This call is clear, penetrating, and seems to possess a ventriloquistic property, for one can hear the Pika call again and again and decide upon a different location for the animal at each utterance. Perhaps some of this elusive diffusion of the sound is due to the Pika's habit of calling from under the rocks, although if the little fellow has not been alarmed he may be calling from some point in plain and obvious sight.

The most evident proof that Pikas are living about a rock-pile is the "hay" stacked under the rocks or against the side of some large stone. These "hay" piles may be numerous and the grasses and foliage in them of varying stages of "cure," from fresh, wilted green cuttings to dry and yellow "hay." The size of the pile is also variable and occasionally a great mass of vegetation, representing many hours of industry, is found. Plate XXXVIII.

If an observer remains quietly near a rock-pile, the Pikas soon come out from their hidden recesses and make their noiseless way over the rocks. Their furry little feet never betray their movements and the animals run soundlessly over the fallen rocks where footing for most four-footed creatures is extremely precarious.

Pikas are active throughout the day and may be seen at most any time. There is evidence to show that they may, on occasion at least, move about at night, possibly to move a harvest that is threatened by approaching storms.

The young vary from three to five, usually three or four in number, and are born from late May or early June to early September.

Family **Leporidae**. Hares and Rabbits

Size medium to large for the Order Lagomorpha; feet digitigrade; hind legs elongate; ears large to very large; tail short; clavicle reduced.

Genus *Lepus*¹

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{2}$; Molars, $\frac{3}{3}$ = 28

Varying Hare.—*Lepus americanus*

and related forms

Names.—Varying Hare; Snowshoe Hare; Snowshoe Rabbit.

General Description.—A medium-sized Hare, with hind legs not excessively elongated, ears large but not as large as in the Jack Rabbits. Hind feet large; tail short; color brownish in summer, white in winter. Plate XXXVI.

Color.—Sexes colored alike.

Summer.—Upperparts.—Grayish brown to buffy brown, generally grayer on top of head; some blackish wash down mid-line of back, and heaviest on rump; ears like top of head but darker at tip, posterior half of ears grayish, merging into black at tip; nape of neck duller than back, grayish or brownish; sides grayer or paler than back, with less black; top of forefeet like top of head; hind feet brownish along outside, merging into buffy near white of underparts, and whitish or buffy on upperside; tail, above, blackish, below, white.

Underparts.—White along abdomen and chin; throat buffy to cinnamon.

Fur slate-colored at base above and below.

Young.—Less richly marked than adults, brown grizzled with gray.

Winter.—Pelage everywhere clear white except for dusky-tipped ears.

Measurements.—Sexes indistinguishable in size. Total length, 18–19 inches; tail vertebrae, 1.6 inches; hind foot, 5.3 inches; height of ear from notch, 2.5 inches.

Geographical Distribution.—Northern half of North America.

Food.—Foliage, twigs, bark of many species of shrubs, grasses, trees, and plants.

Enemies.—Hawks, Owls, and carnivorous mammals such as Weasel, Fox, Coyote, et cetera.

¹ For a full review of the Rabbits and Hares of North America see E. W. Nelson, *North American Fauna*, No. 29, 1909.

FIG. 101. Distribution of the Varying Hares, after Nelson

1. *Lepus americanus americanus*
2. *Lepus americanus virginianus*
3. *Lepus americanus struthopus*
4. *Lepus americanus phaeonotus*
5. *Lepus americanus macfarlanei*
6. *Lepus americanus dalli*
7. *Lepus bairdi bairdi*
8. *Lepus bairdi cascadenis*
9. *Lepus washingtoni washingtoni* (on Nelson's map this extends south to Columbia River)
10. *Lepus washingtoni klamathensis*
11. *Lepus americanus columbiensis* (should reach across boundary into Alberta)
12. *Lepus americanus bishopi*



Species and Subspecies of the Genus *Lepus*

Subgenus *Lepus*. Varying Hares; Arctic Hares; White-tailed Jack Rabbits

This group is distinguished, among other characters, by two distinct pelages, summer and winter, one or both of which is white. The Varying Hares are all brownish in summer and white in winter (except *washingtoni*).

Varying Hare or White Rabbit.—*Lepus americanus americanus* Erxleben. Plate XXXVI.

The animal described above. Found in "Region about southern end of Hudson Bay, including southern Keewatin; southeastern Mackenzie; most of Saskatchewan; Manitoba; east through northern Ontario (including Isle Royale and Michipicoten Island, Lake Superior); northern Quebec; all of Ungava except extreme northern part; Labrador; south in the United States in all of Michigan north of Saginaw (except western half of northern peninsula), and west in an isolated colony on the Bighorn Mountains, Wyoming. Vertical range, from sea level at Hudson Bay to about 2,000 feet near Lake Superior and 10,000 feet in the Bighorn Mountains of Wyoming; zonal range, mainly Canadian." (Nelson)

Nova Scotia Varying Hare.—*Lepus americanus struthopus* Bangs.

About same body size as typical *americanus*, but ears longer; color may be almost indistinguishable from that of typical *americanus*, but generally with more cinnamon in upperparts. Found in "Maine, east of Penobscot River, Nova Scotia, New Brunswick, eastern Quebec (south of lower St. Lawrence and including Magdalen Islands), and Newfoundland. Vertical range, from sea level up to over 2,500 feet altitude in New Brunswick; zonal range, Canadian." (Nelson)

Virginia Varying Hare.—*Lepus americanus virginianus* (Harlan).

The largest of the Varying Hares as well as the brightest and richest in coloration (summer). Upperparts generally with rusty ochraceous brown. Total length, 20-21 inches; tail vertebræ, 2 inches; hind foot, 5.5 inches. Found in "Mountains of West Virginia and Virginia north through Maryland, Pennsylvania, New York, New Jersey, Delaware, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, most of Maine east to Penobscot River and Mount Katahdin, and extreme southern Ontario. Vertical range from near sea level in Rhode Island up to over 4,000 feet in the Adirondacks of New York; zonal range, Canadian." (Nelson)

VARYING HARE

Minnesota Varying Hare.—*Lepus americanus phæonotus* Allen. Resembling typical *americanus* in size but paler and with more buffy in summer pelage. Found in "Western half of northern peninsula of Michigan, northern Wisconsin, northern Minnesota, and north into extreme western Ontario, and southern Manitoba. Vertical range from about 900 to 2,000 feet in northern peninsula of Michigan; zonal range, Canadian." (Nelson)

Turtle Mountain Snowshoe Rabbit.—*Lepus americanus bishopi* (Allen).

A dull brown Hare resembling typical *americanus*, but probably darker (rusty ochraceous) than the other forms of *americanus*. Known only from very inadequate material from Turtle Mountains of North Dakota.

Mackenzie Varying Hare.—*Lepus americanus macfarlani* Merriam.

Darker and larger than typical *americanus*; dark brownish gray above. Total length, 19.5 inches; tail vertebræ, 1.6 inches; hind foot, 6 inches; ear from notch, 2.6 inches. Found in "Wooded parts of Alaska, in Upper Yukon region, and southwest to Cook Inlet; base of Alaska Peninsula and all of Yukon Territory, western Mackenzie, northern British Columbia, and northwestern Alberta, Canada. Its northern limit coincides with that of the trees. Vertical range, in the Mackenzie River region, from near sea level up to over 2,000 feet altitude; zonal range mainly Hudsonian." (Nelson)

Alaska Varying Hare.—*Lepus americanus dalli* Merriam.

Closely resembling *macfarlani*, but ochraceous buffy above in summer pelage. Found in "Wooded parts of western Alaska from below Fort Yukon to coast of Bering Sea at mouth of Yukon, and from Bristol Bay north to tree limit. Vertical range from near sea level on lower Yukon up to about 2,000 feet on adjacent mountains; zonal range mainly Hudsonian." (Nelson)

British Columbia Snowshoe Rabbit.—*Lepus americanus columbiensis* Rhoads.

Smaller than typical *americanus*; total length, 17.5 inches; tail vertebræ, 1.6 inches; hind foot, 5.4 inches; ear from notch, 2.6 inches. Color of upperparts dingy yellowish buffy. Found in "Rocky Mountain region of southeastern British Columbia (except extreme southeastern corner) and western Alberta, Canada (from Vernon, British Columbia, to Jasper House, Alberta). Vertical and zonal ranges not definitely known." (Nelson)

Washington Varying Hare.—*Lepus washingtoni washingtoni* Baird.

Summer and winter pelages both dull, dark reddish brown (no white winter pelage); tops of feet more intense reddish; soles of hind feet sooty. Size small, with short ears and feet. Total length, 17–18 inches; tail vertebræ, 1.6 inches;

hind foot, 5 inches; ear from notch, 2.5 inches. Found in "Washington and north to Fraser River, British Columbia, from the western slope of the Cascade Mountains to the sea (including the Olympic Mountains). Vertical range from sea level to about 3,500 feet on the west slope of the Cascades; zonal range mainly Transition and Canadian." (Nelson)

Oregon Snowshoe Rabbit.—*Lepus washingtoni klamathensis* (Merriam).

Closely resembling typical *washingtoni* in size and color, but pelage paler and with more pinkish cinnamon tone. Found in "Cascade Mountains and adjacent parts of Oregon and higher parts of Sierra Nevada of eastern California south at least to Pacific, Eldorado County. Vertical range from about 4,000 feet in mountains near Fort Klamath up probably to timberline; zonal range, mainly Canadian." (Nelson)

Rocky Mountain Snowshoe Rabbit.—*Lepus bairdi bairdi* Hayden. Plate XXXIX.

Size of body about as in typical *americanus*, but with longer ears and hind feet. Total length, 18.4 inches; tail vertebrae, 1.6 inches; hind foot, 5.8 inches; ear from notch, 2.8 inches. Color of upperparts (summer) buffy grayish brown to rusty brown; winter pelage white, with black-bordered tips of ears and underparts pale salmon. Found in "Higher parts of Rocky Mountains from Idaho, Montana, and extreme eastern Washington and Oregon southeast through western Wyoming, eastern Utah, and middle Colorado to central New Mexico. Also probably extreme southern Alberta and extreme southeastern British Columbia, though no specimens have been seen from these areas. Vertical range from about 8,000 to 11,000 feet (timberline) in northern New Mexico and Colorado; zonal range, Canadian and Hudsonian." (Nelson)

Cascade Mountain Snowshoe Rabbit.—*Lepus bairdi cascaden-sis* Nelson.

Color above (summer), darker than typical *bairdi*, with more black on rump and more reddish along the back. Like typical *bairdi*, white in winter. Size about as in typical *bairdi*. Found in "Cascade Mountains near extreme southern border of British Columbia from Hope, on Fraser River, south along east side of mountains at least to Martin and Easton, Washington. Vertical range undetermined; zonal range probably Canadian and Hudsonian." (Nelson)

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The Varying Hares are larger than the Cottontail Rabbits and in the regions where both occur are generally less abundant. North of the range of the Cottontails, the Varying Hares may be very abundant, and in general it may be said that the latter live in colder climates (higher altitudes or more northern latitudes) than the former. Varying Hares may be

VARYING HARE

distinguished from Cottontails by larger size, longer hind legs, larger hind feet, no white underside to tail (in brown summer pelage), and white winter pelage; in the summer pelage the Varying Hares are generally a duller brown than any of the Cottontails.

The Varying Hares are so named from the fact that the pelage varies with the season, brownish in summer, white in winter. Although the transition seems to be rapid, and it was formerly supposed to be a change of color in the hair itself, the new pelage is the result of molt or shedding followed by a growth of new hair. In fall and spring, specimens may be secured in which the pelage is particolored, brown and white.

Next to the assumption of a snow pelage, the most noteworthy feature of these Hares is the large hind feet which earns them the name of Snowshoe Rabbits, in some localities. The broad hind feet serve as snow-shoes and carry the Hare over the surface of deep snows which would otherwise make him an easy prey for the first Lynx he encountered.

In the North, Varying Hares have years of great abundance followed by a year or two of great scarcity and then several seasons of gradual increase. At the peak of one of these cycles the Hares are everywhere, but the animals are soon attacked by disease which nearly exterminates the species. The disease may be of bacterial origin or due to an infestation of insect parasites. Both diagnoses have been given for dead Hares secured at such a time, according to Seton. This Hare is one of the principal food mammals for small carnivores over much of its range, and accordingly as the Hares are abundant or scarce much of the other animal life may vary.

Varying Hares may be called up by squeaking on the back of the hand. At least they will come to this call in the North, according to Preble, and I have successfully called them in the Rocky Mountain region.

Varying Hares have usually three or four young in a litter, but may have as many as eight or ten during the cycle of increase. There is evidence to show that these Hares have more than one litter a year.

Lepus townsendii Group.—White-tailed Jack Rabbits

This section of the subgenus *Lepus* are all large forms, heavy-bodied, with long ears and hind legs. Where the range

of these forms meets severe winter conditions, white winter pelages are assumed. The tail is nearly always white.

Western White-tailed Jack Rabbit.—*Lepus townsendii townsendii* Bachman.

Resembling *campanius* in summer pelage, but lacking the buffy suffusion on upperparts. Smaller in size and with less black on ears. Winter pelage, when white, as in *campanius*, or becoming pale creamy or buffy gray. Total length, 23 inches; tail vertebræ, 3.2 inches; hind foot, 6 inches; ear from notch, 4.2 inches. Found in "Great Basin region, including east slopes of Cascade Range, and thence east to Rocky Mountains, occupying eastern Washington and Oregon, and north to Fairview, in Okanogan Valley, British Columbia; and from the northeastern corner of California easterly through northern Nevada, western and southern Idaho, extreme southwestern Wyoming, most of Utah, and Colorado from western border to summit of Rocky Mountains. Vertical range, from about 1,000 feet in eastern Washington to 12,000 feet in Colorado; zonal range mainly Upper Sonoran and Transition, but reaches up to Hudsonian in the mountains of Colorado." (Nelson)

White-tailed Jack Rabbit.—*Lepus townsendii campanius* Holister. Plate XXXVI.

Size large, body heavy, ears large, tail long and white throughout the year. Total length, 24 inches; tail vertebræ, 3.6 inches; hind foot, 6 inches; ear from notch, 3.8 inches. Color above (summer), practically a uniform buffy gray with yellowish suffusion; nape buffy to grayish; tail completely white, sometimes with a faint dusky median line above; legs much like back; tops of hind feet whitish; underparts white, except for throat which is gray with buffy wash; ears brownish, washed with buffy or gray, black-tipped and with white on posterior half. Winter pelage, in northern part of range, pure white except for black tips to ears and irregular buffy patches on top side of forefeet, nose, and about eyes; dark rusty area about front and inside of ears; underfur of upperparts usually reddish brown. Where winter change of pelage does not occur the coat is much as in summer, except paler in tone. Found in "Great Plains of Saskatchewan in Alberta, Saskatchewan, and Manitoba, Canada, and thence south on plains of the United States, east of the Rocky Mountains, over Montana, Wyoming (except extreme southwestern part), the Dakotas, Minnesota to extreme southeastern corner (Lanesboro), Iowa east to the Mississippi River (Muscatine), Nebraska, northern half of Kansas, Colorado east of summit of the Rocky Mountains, and middle northern border of New Mexico. Vertical range from less than 1,000 feet in Iowa up to at least 10,000 feet on the mountains of Colorado; zonal range, mainly Upper Sonoran and Transition on the plains of the

WHITE-TAILED JACK RABBIT

western United States, extending into Canadian on the mountains and in the northern part of its range." (Nelson)

Sierra White-tailed Jack Rabbit.—*Lepus townsendii sierræ* (Merriam.)

Large, with larger hind feet and longer ears than either of the other two forms. Summer pelage much like that of typical *townsendii*. Winter pelage white with yellowish about top of head and on forefeet; ears broadly tipped with black. Total length, 25.5 inches; tail vertebræ, 4.5 inches; hind foot, 6.5 inches; ear from notch, 4.5 inches. "In summer, high slopes of Sierra Nevada of California, probably from Mount Shasta south to Mount Whitney; in winter, ranging down the east slope to Mono Lake region on the sagebrush plains of eastern California. Vertical range in summer from about 9,000 to over 12,000 feet; zonal range, Boreal." (Nelson)

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The White-tailed Jack Rabbits are easily distinguished from the other Jack Rabbits (subgenus *Macrotolagus*) by the very apparent difference in the tails. The conspicuously white tail of this group marks these forms as well as the white underside of the tail advertises the Cottontail Rabbit.

White-tailed Jacks are denizens of the prairies and open plains, but range up on mountain slopes to high elevations. On the plains they may be found together with the Black-tailed Jack Rabbits, but they are larger than the Black-tails and, I believe, are faster runners. The powerful hind limbs propel the White-tail in tremendous leaps,—from twelve to twenty feet in length. I have never found the White-tails to be as abundant as the Black-tails. The average number of young in a litter is four.

Lepus arcticus Group.—Arctic Hares

This section includes the large, heavy Hares of the Arctic regions, living, for the most part, north of the tree limit. These species have two annual pelages, the winter one always white; pelage quite long and thick. Plate XXXVI.

American Arctic Hare.—*Lepus arcticus arcticus* Ross.

Size large. Color in summer, above, grizzled silvery gray, paler on top of head, which is faintly washed with buffy; sides and rump darker; underfur dull brownish buffy; tail white above and below; ears blackish on anterior outer half, whitish on posterior half, a small black tip; underparts white, throat smoky gray. Winter pelage white except for small black tip on ears. Total length, 26–27 inches; tail

vertebræ, 2.5 inches; hind foot, 6 inches; ear from notch, 4.7 inches. Found in "Baffin Land, and probably adjoining islands to the west; extreme north coast of Hudson Bay and



FIG. 102. Arctic Hare

south across Hudson Strait to include most of Ungava to Great Whale River on the east shore of Hudson Bay, and Labrador north of Hamilton Inlet. Vertical range from sea level to an undetermined altitude; zonal range, Arctic." (Nelson)

Newfoundland Hare.—*Lepus arcticus bangsi* Rhoads.

Resembling typical *arcticus*, but upperparts grizzled, smoky gray, head dull buffy; rump blackish; ears glossy black grizzled with gray about anterior base, and with a narrow white line along posterior border. Total length, 24 inches; tail vertebræ, 2.5 inches; hind foot, 6.5 inches; ear from notch, 3.6 inches. Found in "Newfoundland and probably adjacent part of Labrador north to Hamilton Inlet, and extreme eastern Quebec. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic." (Nelson)

Hudson Bay Arctic Hare.—*Lepus arcticus canus* Preble.

Much like typical *arcticus*, but paler gray above and more white on ears in summer pelage. Found in "Barren Grounds of northern Canada south to York Factory, Kee-watin, and northern shores of Great Slave and Great Bear lakes. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic." (Nelson)

Alaska Tundra Hare.—*Lepus othus* Merriam.

Largest of American Arctic Hares, approached in size only by *grænlandicus*. Hind foot very large, 7 inches in length.

Darker in summer pelage than other American Arctic Hares. Winter pelage white, ears black-tipped. Color of back (summer), dusky brown, finely grizzled with gray, grayer on sides, blackish brown on top of head, dark cinnamon or buffy about nose and mouth; orbital ring white; ears dusky, washed with gray, tipped with blackish; underparts white. Found in "Tundras of northern and northwestern Alaska, exclusive of the Peninsula and Bristol Bay section. Vertical range from sea level up to over 2,000 feet altitude; zonal range, Arctic." (Nelson)

Alaska Peninsula Hare.—*Lepus poadromus* Merriam.

Characterized by dull cinnamon coloration (summer), small, dusky gray tail, white hind feet. Winter pelage white, with black-tipped ears. Total length, 24 inches; tail vertebrae, 2.1 inches; hind foot, 6 inches; ear from notch, 3.2 inches. Found in "Peninsula of Alaska and Bristol Bay district of Alaska. Vertical range from sea level up to an undetermined altitude; zonal range, Arctic." (Nelson)

Subgenus *Boreolepus*

Greenland Hare.—*Lepus grænlandicus* Rhoads.

Larger than typical *arcticus*. Total length, 26.5 inches; tail vertebrae, 3 inches; hind foot, 4.8 inches; ear from notch, 3 inches. Color above (summer), dusky whitish, a fine sprinkling of black hairs on back and sides of head; ears dusky gray, with small black tip; below, pure white; the summer pelage is essentially white, the winter pelage pure white except for small, black tip on ears. Claws very large; long and projecting upper incisors; pelage exceedingly thick. Found in "Northwestern coasts of northern Greenland and Ellesmere Land. Vertical range from sea level to an undetermined altitude; zonal range, Arctic." (Nelson)

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The large, heavy-bodied, Arctic Hares live so far north that they are seldom seen except by the trapper or sportsman who goes far afield. They are the largest American members of the family Leporidae, some of the species reaching a weight of 11 pounds. These Hares are a principal food item for Foxes, Weasels, Lynxes, and Great Snowy Owls. The change in pelage is an aid in escaping enemies, since the summer coat blends well with the scrub vegetation and open ground, while the pure white winter coat matches the snow so well that the outline of the animal is lost.

Subgenus **Macrotolagus**.—See Black-tailed Jack Rabbits.

White-sided Jack Rabbits

This group is made up of large Jack Rabbits which have a whitish area on the sides from shoulder to rump and lack the black on the posterior tip of the ears. This subgenus contains the most showy of the North American Leporidae, all of the five species and two subspecies being confined to desert or arid regions. The group is essentially Mexican in its distribution, only two forms ranging north into the United States.

Antelope Jack Rabbit.—*Lepus alleni alleni* Mearns.

Size very large; ears enormous; tail short. Total length, 24 inches; tail vertebræ, 2.5 inches; hind foot, 5.2 inches; ear from notch, 6 inches. Color of back cream-buff with black wash; top of head like back; ears buffy in front, whitish behind; nape brownish buff; eye-ring whitish or buffy; sides of shoulders to rump and outside of hind legs light iron-gray; upperside of forelegs and forefeet grayish buff grizzled with dusky; tail white except for blackish area extending from rump down to about middle of upperside of tail; underparts clear white except for buffy area on throat. Found in "The desert plains of southern Arizona, from Phoenix, Tucson, and Benson, south. . . . Vertical range from near sea level in Sonora up to about 3,500 feet in southern Arizona; zonal distribution Lower Sonoran." (Nelson) Plate XXXVI.

Gaillard Jack Rabbit.—*Lepus gaillardi gaillardi* Mearns.

Smaller than typical *alleni*; total length, 21.5 inches; tail vertebræ, 3.2 inches; hind foot, 5.3 inches; ear from notch, 4.5 inches. Color above, head, and back, deep vinaceous buff; a median dusky line down rump onto tail; front of hind legs and feet white, forelegs grayer; underparts white except for buffy throat. Found on "Grassy plains of southwestern New Mexico near Mexican border and southward. . . ." (Nelson)

Gray-sided Jack Rabbits

This section of the subgenus *Macrotolagus* comprises the so-called Black-tailed Jack Rabbits, of large size, long hind legs, long ears, and black tails. Plate XXXVI.

California Jack Rabbit.—*Lepus californicus californicus* Gray.

Size large, darkest colored of the Jack Rabbits found in the United States. Total length, 24 inches; tail vertebræ, 4 inches; hind foot, 5.2 inches; ear from notch, 5.2 inches. Color of upperparts dark ochraceous buffy, sometimes with

BLACK-TAILED JACK RABBIT

a heavy black wash; sides with less black than back and toning gradually into a clearer buffy on lower flanks; outside of hind legs darker than sides; shoulders and forelegs brighter, sometimes cinnamon-rufous; tops of forelegs and hind legs whitish; eye-ring warm buffy; nape dark cinnamon; ears grizzled cinnamon and dark brown on anterior



FIG. 103. Black-tailed Jack Rabbit

half, whitish on posterior half, tip heavily marked with black for an extent of from one to two inches; top of tail black, an extension of the dark median area down rump, underside of tail dark buffy; color of underparts ochraceous buffy, paler on middle of abdomen; throat a darker buff than rest of underparts. Found in "Humid coast belt of California from Gaviota Pass north to Cape Mendocino, spreading inland over extreme northern end of San Joaquin Valley, all of Sacramento Valley, up through the adjacent foothills of the Sierra, and north through Shasta Valley to Rogue River and Willamette Valley in Oregon. Vertical range from sea level at San Francisco up to about 3,000 feet altitude on west slope of the Sierra; zonal range mainly Upper Sonoran and lower border of the Transition Zone." (Nelson)

Washington Jack Rabbit.—*Lepus californicus wallawalla* (Merriam). Plate XXXIX.

Paler and smaller than typical *californicus*, iron-gray above, washed with pinkish buffy. Total length, 23 inches; tail

vertebræ, 4 inches; hind foot, 5.4 inches; ear from notch, 4.5 inches. Found in "Northeastern California, northwestern Nevada, and north through eastern Oregon and eastern Washington. Vertical range from about 1,000 feet in eastern Washington to 6,000 feet in northeastern California; zonal range mainly Upper Sonoran extending into lower part of Transition Zone." (Nelson)

San Joaquin Valley Jack Rabbit.—*Lepus californicus richardsoni* (Bachman).

Smaller than typical *californicus*. Total length, 22–23 inches; tail vertebræ, 4 inches; hind foot, 5 inches; ear from notch, 4.5 inches. Paler than typical *californicus*, color above grayish buff to sandy buff. Found in "San Joaquin Valley, California, and adjacent arid valleys to the west and surrounding foothills. Vertical range from below 500 feet in Salinas Valley up to 4,000 feet in mountains about San Joaquin Valley; zonal range mainly Lower Sonoran, extending up through Upper Sonoran." (Nelson)

San Diego Jack Rabbit.—*Lepus californicus bennetti* (Gray).

Smaller and paler than typical *californicus*. Total length, 22 inches; tail vertebræ, 3.4 inches; hind foot, 5 inches; ear from notch, 4.5 inches. Color above, pinkish buff washed with black; black ear-tip smaller than in typical *californicus* and less contrast between color of tops of fore- and hind feet and color of upper legs. Found in "Southern California west of summit of Coast Range from near Gaviota Pass to Mexican border and south. . . . Vertical range from sea level at San Diego up to about 6,000 feet altitude in mountains to the eastward; zonal range mainly Upper Sonoran." (Nelson)

Colorado Desert Jack Rabbit.—*Lepus californicus deserticola* (Mearns).

Very pale in color above, ashy gray, with very little black wash; middle of abdomen white; smaller than typical *californicus*, but with proportionally larger ears. Total length, 22 inches; tail vertebræ, 3.5 inches; hind foot, 5 inches; ear from notch, 5 inches. Found in "Arid desert areas . . . north through southeastern California (east of Coast Range and Sierra Nevada) at least to Mono Lake, through most of Nevada, except the northwestern part north of Pyramid Lake, most of Utah and southern Idaho, to Pahsimeroi Valley, and east to Phoenix and San Francisco mountains in Arizona. Vertical range from below sea level in the Colorado Desert to 7,500 feet in the border of the pine forest on the Mogollon plateau of northern Arizona, and to 9,000 feet in the San Bernardino Mountains, California; zonal range mainly Upper and Lower Sonoran." (Nelson)

Arizona Jack Rabbit.—*Lepus californicus eremicus* (Allen).

Paler and lighter in color than typical *californicus*. Above, dark cream-buff to light pinkish buff with heavy blackish wash. Darker than *deserticola*. Total length, 24 inches;

BLACK-TAILED JACK RABBIT

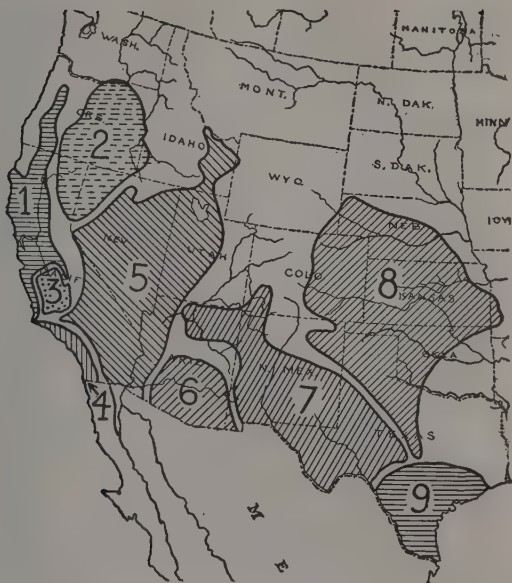


FIG. 104. Distribution of the subspecies of *Lepus californicus*, north of Mexico, after Nelson

1. *Lepus californicus californicus*
2. *Lepus californicus wallawalla*
3. *Lepus californicus tularensis*
4. *Lepus californicus bennetti*
5. *Lepus californicus deserticola*
6. *Lepus californicus eremicus*
7. *Lepus californicus texianus*
8. *Lepus californicus melanotis*
9. *Lepus californicus merriami*

tail vertebræ, 4 inches; hind foot, 5.4 inches; ear from notch, 5 inches. Found "north throughout southern Arizona east of Phoenix and south of the high mountains; also along the border in southwestern New Mexico. . . . Vertical distribution from about 2,000 feet west of Tucson to 5,000 feet near Wilcox; zonal distribution mainly Lower Sonoran, extending up into lower part of Upper Sonoran Zone." (Nelson)

Texas Jack Rabbit.—*Lepus californicus texianus* (Waterhouse). Light in color, large in size, long-eared. Pale buffy gray above, with light black wash, a whitish gray rump patch present; underparts white with practically no buffy suffusion. Total length, 24 inches; tail vertebræ, 3.4 inches; hind foot, 5.4 inches; ear from notch, 5 inches. Found in "arid western Texas (except northern Panhandle), New Mexico (except northeastern part), northeastern Arizona (valley of Little Colorado River), and southwestern part of Colorado. Vertical range from about 1,500 feet above Del Rio, Texas, to 7,500 feet altitude on mountains of New Mexico; zonal range mainly Upper Sonoran, but extending down into Lower Sonoran and up in summer into lower border of Transition Zone." (Nelson)

Great Plains Jack Rabbit.—*Lepus californicus melanotis* (Mearns).

Above, ochraceous buffy, bright in tone, with dark wash of black; conspicuous, large, whitish rump patch; black band from rump onto tail broad and well developed; throat richly colored, deep ochraceous buff. Total length, 23 inches; tail vertebræ, 3.2 inches; hind foot, 5.2 inches; ear from notch, 4.2 inches. Found in "Great Plains from east central and northern Texas, northeastern New Mexico and north through western half of Indian Territory, all of Oklahoma, extreme southwestern part of Missouri, all of Kansas and Nebraska, except perhaps extreme eastern parts, southwestern Dakota, southeastern Wyoming, and all of Colorado east of Rocky Mountains. Vertical range from less than 1,000 feet near Independence, Kansas, to over 6,000 feet on east base of mountains in Colorado; zonal range mainly Upper Sonoran." (Nelson)

Merriam Jack Rabbit.—*Lepus californicus merriami* (Mearns). Color above like *eremicus*, but darker; dark brownish buffy; nape black or nearly so; iron-gray rump and hind legs; underparts clear white. Total length, 24 inches; tail vertebræ, 4 inches; hind foot, 5 inches; ear from notch, 4.6 inches. Found in "All of southern Texas from coast prairies near Trinity River west to a little above Del Rio on the Rio Grande, north to Mason and Antioch, and south across the Rio Grande. . . . Vertical range from sea level in southern Texas up to about 5,000 feet in mountains . . . ; zonal range mainly Lower Sonoran . . ." (Nelson)

* * * * *

The Black-tailed Jack Rabbits are the most conspicuous of western Leporidae. They are not as showy as the White-sided Jacks, but they are found over a much larger range in the United States and are better known in consequence. The Black-tails, with their high, leaping gait, are a common sight from any of the transcontinental railroads or automobile

routes, and during seasons of abundance may be seen literally by hundreds. Sometimes communities have organized drives against Black-tailed Jack Rabbits, when crops were threatened by too great numbers, and thousands have been killed in a single day's drive.

These Rabbits are well characterized by large size, huge ears, long hind legs and black tail, and will be recognized at long distances. The speed of the Black-tail is so great that the average Dog stands no chance of catching it and only Greyhounds can overtake it in a fair run.

Both the senses of sight and of hearing are keen in the Black-tail and often the Jack runs long before the hunter is in range. At other times it may lie so close that it is almost stepped upon. In brushy districts where the Jack must run between the bushes, its course is erratic, but in the open it is direct or slightly circling unless very closely pressed, when the animal may change direction very abruptly. When running, every so often it leaps much higher than usual, probably to enable it to watch the back track and the whereabouts of the pursuer.

When not feeding, Jack Rabbits lie in forms or under bushes. The form is merely a shallow depression in the dust, and when the animal cowers in it, with ears lying close along the body, one is apt to pass by without noticing the Jack.

These animals do a great deal of damage in ranching districts, gathering in large numbers about alfalfa fields or coming in to hay stacks in winter. Natural enemies, such as Coyotes, Wolves, Eagles, et cetera, check their numbers to a certain extent, but since these latter animals are themselves frequently killed at every opportunity, the rancher must rely upon guns and poison to control the Rabbits.

Jack Rabbits have from two to four young in a litter and may have several litters a year. Young Jacks are more easily caught than young Cottontail Rabbits and are more apt to remain motionless, trusting to their protective coloration to escape.

Genus *Sylvilagus*¹

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{2}$; Molars, $\frac{3}{3}$ = 28.

¹ See footnote, page 478.

Cottontail.—*Sylvilagus floridanus*

and related forms

Names.—Cottontail; Cottontail Rabbit; Wood Rabbit.**General Description.**—Of small or medium size; hind legs long, but not so well developed as in the Jack Rabbits;

FIG. 105. Cottontail

ears large but not excessively developed; tail short, with conspicuous white underside; pelage full and soft, brownish above, white below. Plate XXXVI.

Color.—Sexes colored alike.

Upperparts.—Varying from dark buffy brown with reddish tinge to brown with grayish wash; sides, rump, and back finely sprinkled with black; nape rich rufous; forelegs dark cinnamon-rufous, forefeet more buffy than legs; lower hind legs intensely dark rufous; tail above, rusty brown, below, clear white; ears dark grayish buffy bordered with black.

Underparts.—White, except for dark ochraceous buffy throat area.

Young.—Yellowish buffy brown, no appreciable rump patch; rusty brown on nape and upperside of tail.

Measurements.—Total length, 14–15 inches; tail vertebræ, 1.8 inches; hind foot, 3.6 inches; ear from notch, 2.2 inches.

Geographical Distribution.—North America, from Canada southward.

Food.—A great variety of green vegetation, grasses, foliage, bark, etc.

Enemies.—Hawks, Owls, Fox, Weasel, Coyote, Wolf, Lynx, and any carnivorous mammal capable of catching it.

Species and subspecies of the genus *Sylvilagus*

Subgenus *Sylvilagus*

Cottontails

Floridanus Group.—Eastern Cottontails

Florida Cottontail.—*Sylvilagus floridanus floridanus* (Allen).
The animal described above. Found in "All of peninsular Florida (including coastal islands) south of Sebastian River and thence northward along the coast to St. Augustine on the east side, and to an unknown distance on the west side. Vertical range from sea level up to about 100 feet altitude; zonal range mainly Lower Austral." (Nelson)

Eastern Cottontail.—*Sylvilagus floridanus mallurus* (Thomas).
Size larger, ears longer than typical *floridanus*; less black washing on upperparts which are dark rusty yellowish. Total length, 18 inches; tail vertebræ, 2.6 inches; hind foot, 3.7 inches; ear from notch, 2.4 inches. Found "Mainly east of Allegheny Mountains from Long Island and the lower Hudson Valley in extreme southeastern New York south through New Jersey, Delaware, eastern Pennsylvania, eastern West Virginia, Maryland, Virginia, North and South Carolina, Georgia, except northwestern part, and west along Gulf coast to near Mobile Bay, and Alabama; also northwestern central parts of Florida south to about Lake Julian, Polk County. Vertical range from near sea level in North Carolina up to about 6,000 feet on Roan Mountain; zonal range from Lower Austral up through Transition Zone, mainly Upper Austral." (Nelson)

Hitchens Cottontail.—*Sylvilagus floridanus hitchensi* Mearns.
Resembling *mallurus* in size but paler in color, "with the bright colors (black and rufous) of the upper parts obsolete, giving a pale sandy fulvous shade to these parts; but the backs of the hind legs are a slightly darker chestnut than in the mainland forms. The skull is larger, heavier. . . . All of the teeth are larger." (Mearns) Total length, 19 inches; tail vertebræ, 2.8 inches; hind foot, 3.8 inches. Found on Fishermans Island and Smiths Island, Northampton County, Virginia.

Mearns Cottontail.—*Sylvilagus floridanus mearnsi* (Allen).
Size of *mallurus*, but ears shorter, hind feet longer, and more gray on upperparts. Hind foot, 4.2 inches. Found "West

of Allegheny Mountains from Lake Simcoe, Toronto, Canada, central New York, central Pennsylvania, western West Virginia, and eastern Kentucky, and eastern Tennessee, west through southern Michigan and Wisconsin to

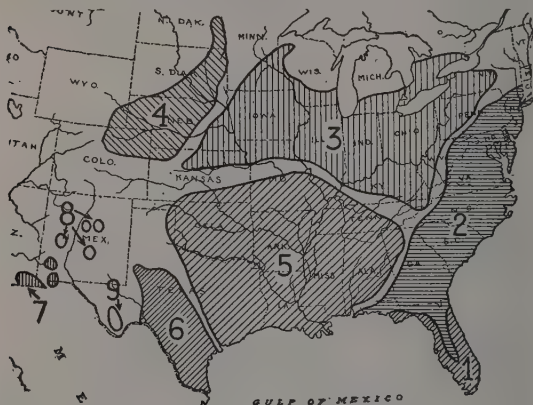


FIG. 106. Distribution of the subspecies of the *Sylvilagus floridanus* group, north of Mexico, after Nelson

1. *Sylvilagus floridanus floridanus*
2. *Sylvilagus floridanus mallurus*
3. *Sylvilagus floridanus mearnsi*
4. *Sylvilagus floridanus similis*
5. *Sylvilagus floridanus alacer*
6. *Sylvilagus floridanus chapmani*
7. *Sylvilagus floridanus holzneri*
8. *Sylvilagus cognatus*
9. *Sylvilagus robustus*

southeastern Minnesota, and south through Iowa to Trego County, Kansas, northern Missouri and Illinois, with all of Indiana and Ohio. Vertical range from about 500 feet in western New York to about 2,000 feet altitude in mountains of western Pennsylvania; zonal range mainly Upper Austral, extending into lower part of Transition zone." (Nelson)

Nebraska Cottontail.—*Sylvilagus floridanus similis* Nelson.

Smaller than *mearnsi* or *mallurus*. Total length, 16 inches; tail vertebræ, 2.1 inches; hind foot, 4 inches; ear from notch, 2 inches. Color of upperparts pale pinkish buffy washed with grayish over shoulders and with black over rest of back. Found on "Dry plains (mainly along wooded streams) of extreme western Minnesota, eastern North and South Dakota, all of Nebraska (except possibly the Missouri

COTTONTAIL

bottom lands), northern Kansas, northeastern Colorado, along tributaries of Platte River to base of mountains near Denver, and southeastern Wyoming. Vertical range, from about 1,500 feet in northeast Nebraska to over 5,000 feet west of Denver, Colorado; zonal range, mainly Upper Sonoran." (Nelson)

Oklahoma Cottontail.—*Sylvilagus floridanus alacer* (Bangs).

Resembling typical *floridanus* in size, but paler and with more rusty red in pelage of upperparts. Found on "Gulf coast from Mobile Bay, Alabama, to Matagorda Bay, Texas, and thence north through most of Alabama to Tate, northwestern Georgia; all of Mississippi, Louisiana, and Arkansas; western Tennessee and Kentucky, extreme southern Illinois, southern Missouri, southeastern Kansas, all of Oklahoma except extreme western part, and eastern Texas to eastern border of Panhandle. Vertical range from near sea level in Louisiana up to about 2,000 feet altitude in Oklahoma; zonal range mainly Lower Austral." (Nelson)

Texas Cottontail.—*Sylvilagus floridanus chapmani* (Allen).

Size small; ears short; feet small; altogether one of the smallest of the *floridanus* group. Pelage of upperparts dark buffy brown grizzled with grayish. Total length, 16 inches; tail vertebræ, 2 inches; hind foot, 3.6 inches; ear from notch, 2 inches. Found in "Arid parts of middle and southern Texas from east of Corpus Christi to mouth of Pecos River and from near Abilene south across the Rio Grande. . . . Vertical range from sea level near Corpus Christi up to about 1,000 feet altitude near Fort Clark, Texas. Zonal range mainly Lower Sonoran." (Nelson)

Holzner Cottontail.—*Sylvilagus floridanus holzneri* (Mearns).

Paler and larger than *chapmani*, with more heavily furred feet and larger ears. Upperparts pale grayish buffy. Total length, 17 inches; tail vertebræ, 2.8 inches; hind foot, 4 inches; ear from notch, 2.5 inches. Found in "Higher mountain ranges of extreme southern Arizona and southwestern New Mexico and thence south. . . . Zonal range mainly Transition and lower border of Canadian, ranging down into Upper Sonoran in winter." (Nelson)

Manzano Mountain Cottontail.—*Sylvilagus cognatus* Nelson.

A long-eared, grayish, mountain-dwelling form. Total length, 18 inches; tail vertebræ, 2.6 inches; hind foot, 4 inches; ear from notch, 2.7 inches. General color of upperparts, dull buffy grayish, washed with black. Found in "High mountain summits and adjacent slopes of central-eastern New Mexico. Vertical range from about 6,500 to 10,200 feet altitude on Manzano Mountains; zonal range mainly Transition, and lower part of Canadian Zone." (Nelson)

Davis Mountains Cottontail.—*Sylvilagus robustus* (Bailey).

Resembling *cognatus* in color and in size, but with larger skull, broader supraorbitals and larger auditory bullæ.

Found in "Davis, Chinati, and Chisos mountains in southwestern Texas. Vertical range mainly above 6,000 feet in Davis Mountains; zonal range mainly Transition." (Nelson)

New England Cottontail.—*Sylvilagus transitionalis* (Bangs). Distinguished by rich pinkish buffy upperparts, sometimes heavily washed with black distributed as streakings; small ears. Total length, 15–16 inches; tail vertebræ, 1.6 inches; hind foot, 3.8 inches; ear from notch, 2.1 inches. Found in "New England States north to Rutland, Vermont, southern New Hampshire, extreme southwestern Maine, and southwest through eastern New York (including southern end of Lake George and Long Island), New Jersey, eastern Pennsylvania, and Maryland to Alexandria, Virginia; also along the Alleghenies through West Virginia to Roan Mountain, North Carolina, and Brasstown Bald Mountain in extreme northern Georgia. Vertical range from near sea level in Virginia to 6,000 feet on Roan Mountain, North Carolina; zonal range mainly Transition and thence down into upper part of Upper Austral Zone." (Nelson)

Nuttalli Group.—Rocky Mountain Cottontails

Washington Cottontail.—*Sylvilagus nuttalli nuttalli* (Bachman).

In size smaller than *floridanus*; ears short and rounded. Total length, 14 inches; tail vertebræ, 1.8 inches; hind foot, 3.6 inches; ear from notch, 2.3 inches. Pelage of upperparts dark fulvous-buffy brown; rump grayer; nape dark rufous; legs rufous; hind feet white (tops); underparts white, fur of breast and abdomen white (generally) to base, elsewhere slate-colored at base; throat dark buffy. Found in "Plains and lower mountain slopes of Columbia River basin in eastern Washington and Oregon; also northeastern California, northwestern Nevada, and western Idaho. Vertical range from about 100 feet on Columbia River to about 3,000 feet altitude near Prineville, Oregon; zonal range mainly Upper Sonoran and lower part of Transition Zone." (Nelson)

Black Hills Cottontail.—*Sylvilagus nuttalli grangeri* (Allen).

Upperparts creamy buff lightly grizzled with gray; larger than typical *nuttalli*. Total length, 15–16 inches; tail vertebræ, 1.8 inches; hind foot, 3.8 inches; ear from notch, 2.3 inches. Found in "Western South Dakota, most of Montana and Wyoming; most of the sagebrush plains of Idaho (except extreme western and northwestern parts), Nevada (except northwestern corner and low valleys in the south); mountains of middle eastern California from near Mono Lake to Panamint Range; most of Utah, and northwestern Colorado; extends north of the United States into southern Alberta and Saskatchewan, Canada. Zonal range mainly

Transition and upper half of Upper Sonoran Zone." (Nelson)

Rocky Mountain Cottontail.—*Sylvilagus nuttalli pinetis* (Allen). Resembling typical *nuttalli* in color but larger; darker than *grangeri*. Upperparts creamy buff to dark pinkish buffy, but always washed with black to give impression of darker

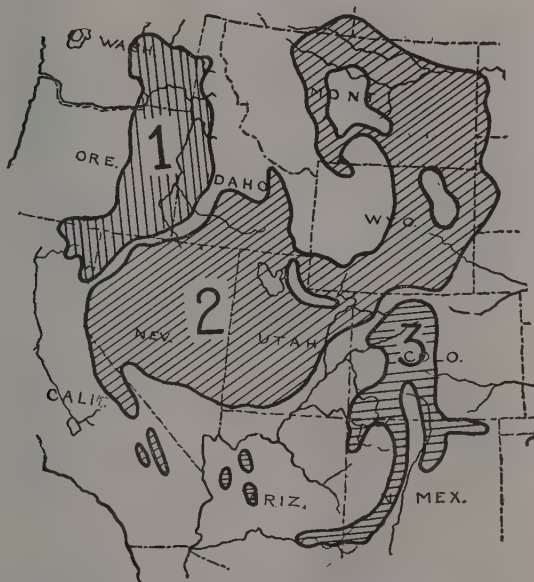


FIG. 107. Distribution of the subspecies of *Sylvilagus nuttalli*, after Nelson

1. *Sylvilagus nuttalli nuttalli*
2. *Sylvilagus nuttalli grangeri*
3. *Sylvilagus nuttalli pinetis* (the artist has departed somewhat from Nelson and the southwestern area of this figure should reach only slightly south of the three detached areas)

color. Total length, 15-16 inches; tail vertebræ, 2.4 inches; hind foot, 3.8 inches; ear from notch, 2.5 inches. Found in "Pine forests of mountains from central Arizona and middle-western New Mexico, north through Colorado except north-western corner. Vertical range in Colorado and New

Mexico from about 7,500 to over 10,000 feet; zonal range mainly Transition and lower edge of Canadian, moving down in winter to border of Upper Sonoran Zone." (Nelson)

Auduboni Group—Western Cottontails

Sacramento Valley Cottontail.—*Sylvilagus auduboni auduboni* (Baird).

Size large; tail large. Total length, 16–17 inches; tail vertebræ, 2.9 inches; hind foot, 3.5 inches; ear from notch, 2.4 inches. Upperparts dark ochraceous buffy brown, heavily washed with black on back; sides grayer and with less black; ears grayish inside, brownish outside; nape bright rusty; legs buffy to rufous; tops of hind feet white; tail brownish like back above, clear white below; underparts clear white, throat brownish buff. Found in "Interior of north-central California from Red Bluff in Sacramento Valley south in suitable localities in valley and foothills to north end of San Joaquin Valley (Chinese Camp on the east and Los Banos on the west), and reaching the coast along the east and south sides of San Francisco Bay, and thence south through the adjacent Santa Clara Valley. Vertical range from sea level at San Francisco Bay up to about 4,000 feet on west slope of Sierra Nevada; zonal range mainly semiarid Upper Sonoran." (Nelson)

San Joaquin Cottontail.—*Sylvilagus auduboni vallicola* Nelson.

Resembling typical *auduboni* in size but ears larger, color paler and yellower. Upperparts dull yellowish-buffy brown; rump grayish; nape pale ochraceous buff. Total length, 16 inches; tail vertebræ, 2.2 inches; hind foot, 3.6 inches; ear from notch, 2.8 inches. Found in "Hot, arid parts of central-interior California in Salinas, Upper Cuyama, and San Joaquin valleys; north to beyond Raymond and south to Walker and Tejon passes. Not found west of the outer Coast Range. Vertical range from about 250 feet in bottom of San Joaquin Valley to 4,500 feet altitude on western slope of Sierra Nevada; zonal range mainly Lower Sonoran, but extending into Upper Sonoran." (Nelson)

San Diego Cottontail.—*Sylvilagus auduboni sanctidiégi* (Miller)

Most like typical *auduboni*, but paler on sides and generally with a grayish rump patch. Upperparts ochraceous buffy brown, with grayer shoulders and sides; forelegs paler (dull rusty rufous) than in typical *auduboni*. Total length, 16 inches; tail vertebræ, 2.6 inches; hind foot, 3.6 inches; ear from notch, 2.8 inches. Found in "Southern California west of the mountains from the southern half of Ventura County to the Mexican border Vertical range from sea level at San Diego up to over 4,000 feet altitude on mountains to the east; zonal range mainly Upper Sonoran." (Nelson)

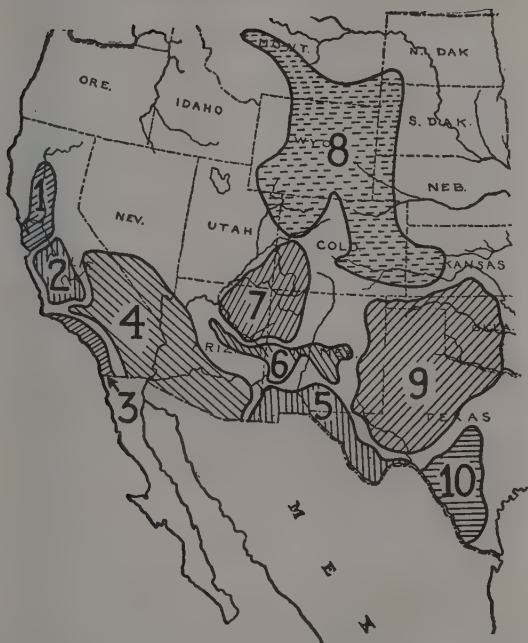


FIG. 108. Distribution of the subspecies of *Sylvilagus auduboni*, north of Mexico, after Nelson

1. *Sylvilagus auduboni auduboni*
2. *Sylvilagus auduboni vallicola*
3. *Sylvilagus auduboni sanctidiegi*
4. *Sylvilagus auduboni arizonæ*
5. *Sylvilagus auduboni minor*
6. *Sylvilagus auduboni cedrophilus*
7. *Sylvilagus auduboni warreni*
8. *Sylvilagus auduboni baileyi*
9. *Sylvilagus auduboni neomexicanus*
10. *Sylvilagus auduboni parvulus*

Arizona Cottontail.—*Sylvilagus auduboni arizonæ* (Allen).

Smaller than typical *auduboni*, with gray rump patch, large (proportionally) ears. Total length, 14–15 inches; tail vertebrae, 2.1 inches; hind foot, 3.4 inches; ear from notch, 2.8 inches. Upperparts pale buffy gray, back lightly washed with black, sides gray. Found in "Deserts of extreme southern Nevada, California (east of the Sierra Nevada and southern Coast Range) from Owens and Death Valleys south across the Mohave and Colorado deserts into northeastern Lower California; nearly all of Arizona below 6,000 feet (except northeastern part) from westerly slopes of San Francisco and White Mountains, south into northern Sonora, Mexico. Vertical range from below sea level in Death Valley up to about 7,000 feet in mountains of western Arizona; zonal range mainly Lower Sonoran, but extending through Upper Sonoran." (Nelson)

Little Cottontail.—*Sylvilagus auduboni minor* (Mearns).

Smaller than *arizonæ*, but similar to it in pale gray coloration. Total length, 14 inches; tail vertebrae, 2.1 inches; hind foot, 3.2 inches; ear from notch, 2.4 inches. Upperparts pale grayish buffy, sparsely washed with black on back; ears darker gray with black border about tips; throat grayish buff. Found in "Extreme western Texas (mainly west of Guadalupe and Davis mountains) and Rio Grande Valley above mouth of Pecos; also plains of extreme southeastern corner of Arizona and southwestern New Mexico, and thence south. . . Zonal range mainly Lower Sonoran, extending up into the Upper Sonoran Zone." (Nelson)

Cedar Belt Cottontail.—*Sylvilagus auduboni cedrophilus* Nelson.

Upperparts dark grayish buffy; rump dull iron-gray; nape deep rusty rufous; throat deep buff to rich ochraceous buffy. Total length, 15 inches; tail vertebrae, 1.8 inches; hind foot, 3.6 inches; ear from notch, 2.5 inches. Found in "Mainly the juniper and pinyon pine belt from Alpine, in the Davis Mountains of Texas, north through mountains of southern half of New Mexico and along the Mogollon range to east side of San Francisco Mountain of east-central Arizona. Vertical range from about 5,000 to 8,000 feet in western New Mexico; zonal range mainly Upper Sonoran." (Nelson)

Colorado Cottontail.—*Sylvilagus auduboni warreni* Nelson.

Upperparts dark creamy buff with heavy black wash on back; sides grayer; nape light rufous; well-defined rump patch of iron-gray; throat dark buff. Total length, 15–16 inches; tail vertebrae, 2 inches; hind foot, 3.9 inches; ear from notch, 2.7 inches. Found in "Southwestern Colorado, southeastern Utah, northwestern New Mexico, northeastern Arizona, including lower half of valley of the Little Colorado River, to east base of San Francisco Mountain, and to Henry Mountains, southeastern Utah. Vertical range from about 5,000 to 8,500 feet in northwestern New

BRUSH RABBIT

Mexico; zonal range mainly Upper Sonoran, extending into Transition and Lower Sonoran Zones." (Nelson)

Wyoming Cottontail.—*Sylvilagus auduboni baileyi* (Merriam). Pelage long and thick, color pale, ears and feet hairy, size large. Total length, 16–17 inches; tail vertebræ, 2.3 inches; hind foot, 3.8 inches; ear from notch, 2.6 inches. Upperparts pale creamy buff, lightly washed with black; nape light rufous; throat dark to creamy buff. Found in "Plains and valleys of eastern Montana, most of Wyoming, north-eastern Utah, northwestern and eastern Colorado (east of the mountains), western parts of North and South Dakota, Nebraska, and as far east as Trego County, Kansas. Vertical range from about 3,000 feet in Kansas to 7,000 feet in Colorado; zonal range mainly arid Upper Sonoran, but ranging into lower part of Transition Zone." (Nelson)

New Mexico Cottontail.—*Sylvilagus auduboni neomexicanus* Nelson.

Like *minor* in size but ears shorter, hind feet longer, color darker and redder. Total length, 15 inches; tail vertebræ, 2 inches; hind foot, 3.5 inches; ear from notch, 2.3 inches. Upperparts dark buffy gray; nape rufous; poorly outlined rump patch dull iron-gray; throat dark ochraceous buffy. Found in "Pecos Valley from near Fort Stockton, Texas, north to about Fort Sumner, New Mexico, and thence east to Abilene and Wichita Falls, Texas, and north through eastern New Mexico, western Texas, and western Oklahoma to extreme south-central Kansas. Vertical range from about 2,500 feet in western Texas to 5,000 feet in eastern New Mexico; zonal range Lower Sonoran and lower part of Upper Sonoran Zone." (Nelson)

Mexican Desert Cottontail.—*Sylvilagus auduboni parvulus* (Allen).

Size of *minor*, but more richly colored. Upperparts dusky buffy gray; faintly defined iron-gray rump patch; nape and forelegs deep rusty rufous; throat ochraceous buff. Found "from Puebla north to Rio Grande Valley of Texas (from Rio Grande City to mouth of Pecos River). Vertical range from below 500 feet on the Rio Grande to over 8,000 feet altitude on southern end of tableland in Mexico; zonal range Upper and Lower Sonoran." (Nelson)

Bachmani Group.—Pacific Coast Brush Rabbits

This group is distinguished by small size, small tail, short legs, and uniformly dark coloration.

California Brush Rabbit.—*Sylvilagus bachmani bachmani* (Waterhouse).

Small in size, with short ears, legs, and tail. Total length, 13 inches; tail vertebræ, 1.3 inches; hind foot, 3 inches; ear

from notch, 2.2 inches. Pelage above, dark grayish brown, lightly washed with reddish; no rump patch; sides grayer than back; ears dark grayish brown; nape dark rusty rufous; tail above like back, below white but not as conspicuously white as in the Cottontails; underparts dull whitish; throat brownish buffy. Found in "California, from Monterey to Santa Monica on west side of the Coast Range; and western foothills of Sierra Nevada from Tulare County to Shasta County. Vertical range along coast from sea level up to over 3,000 feet altitude in adjacent mountains; zonal range semihumid Upper Sonoran into semihumid Transition Zone (mainly Upper Sonoran)." (Nelson)

Redwood Brush Rabbit.—*Sylvilagus bachmani ubericolor* (Miller).

Larger than typical *bachmani*, but ears smaller, color darker and redder. Total length, 14.5 inches; tail vertebrae, 1.5 inches; hind foot, 3.1 inches; ear from notch, 2 inches. Upperparts rich reddish brown; nape dark rufous; underparts soiled whitish, sometimes washed with buffy; throat dull buffy. Found in "Mainly humid coast belt from near Monterey Bay, California, north to near Columbia River (Beaverton), Oregon, and inland in northern California to head of Sacramento Valley at Tehama and Stillwater. Vertical range from sea level up to 1000 feet or more in northern California; zonal distribution mainly Humid Transition." (Nelson)

California Brush Rabbit.—*Sylvilagus bachmani cinerascens* (Allen).

Resembling typical *bachmani*, but grayer brown above and grayer below, feet whiter, and ears larger. Total length, 12.5 inches; tail vertebrae, 1.6 inches; hind foot, 2.8 inches; ear from notch, 2.3 inches. Upperparts varying from dark grayish brown to dull buffy brown (grayer in spring and summer); underparts white but with slate color of underfur showing through. Found in "Arid brush-grown slopes of southern and western sides of San Joaquin and neighboring valleys in California, as far north as Jolon and Jamesburg and thence south throughout southern California west of the summit of the mountains (reaching the coast south of Santa Monica) . . . Vertical range, from sea level up to 6,000 feet altitude in northern Lower California; zonal range, through Upper Sonoran Zone up into Transition (mainly Upper Sonoran)." (Nelson)

Subgenus *Tapeti*

Palustris Group.—Swamp Rabbits

This group is characterized by a marsh or swamp habitat, dark color, and short tail which lacks the conspicuously white underside of the true Cottontails.

Marsh Rabbit; Carolina Marsh Rabbit.—*Sylvilagus palustris palustris* (Bachman). Plate XXXVI.

About equal in size to *Sylvilagus floridanus*; feet small and slender; tail very short; ears broad and short. Total length, 17.5 inches; tail vertebræ, 1.3 inches; hind foot, 3.6 inches; ear from notch, 2.1 inches. Upperparts rich dark reddish



FIG. 109. Distribution of the species and subspecies of the *Sylvilagus palustris* group, after Nelson

1. *Sylvilagus aquaticus aquaticus*
2. *Sylvilagus palustris palustris*
3. *Sylvilagus palustris paludicola*
4. *Sylvilagus aquaticus littoralis*

brown; rump to back of hind legs dark rusty reddish; nape dark rufous; ears grayish buffy brown; tail above like rump, below, dingy gray (never white); underparts white, bordered along flanks and sides with ochraceous buff; throat ochraceous buff. Found in "Lowlands along rivers and coast of southeastern States from Dismal Swamp, Virginia, south to extreme northern Florida, and west through most of southern Georgia and the Gulf coast of northwestern Florida to east side of Mobile Bay, Alabama. Vertical range from sea level to an undetermined altitude (probably less than 500 feet); zonal range Lower Austral." (Nelson)

Florida Marsh Rabbit.—*Sylvilagus palustris paludicola* (Miller and Bangs).

Smallest of the Marsh Rabbits as well as the darkest and reddest, with very short, broad ears. Total length, 17 inches; tail vertebræ, 1.6 inches; hind foot, 3.5 inches; ear

from notch, 1.8 inches. Upperparts dark ochraceous brown becoming dark ochraceous buff on flanks and sides; rump often more rufous than rest of upperparts; tail above, chestnut, below, grayish white to brownish gray; nape rich cinnamon-rufous; feet and legs dark cinnamon-rufous; underparts white but encroached upon by dark brownish buff of lower sides. Found in "Peninsular Florida and adjacent coast islands, north along the east coast at least to San Mateo, and on the west side for an unknown distance northwest of the type locality, but probably some distance beyond the Suwanee River. Vertical range from sea level up to about 100 feet altitude; zonal range extreme Lower Austral and upper border of Humid Tropical Zone." (Nelson)

Swamp Rabbit.—*Sylvilagus aquaticus aquaticus* (Bachman).

Larger than *palustris*, with larger ears. Total length, 21–22 inches; tail vertebræ, 2.8 inches; hind foot, 4.2 inches; ear from notch, 2.7 inches. Upperparts grayish brown washed with buffy, top of head ochraceous buffy brown; rump reddish brown; sides grayer than back; legs and feet cinnamon-rufous; ears like top of head in color; tail, above, like rump, below, white; underparts clear white; throat dull buffy grayish. Found in "River bottoms and swampy woods from Lumpkin, southwestern Georgia, west to Medina River near San Antonio, middle Texas, and north at least to Hartshorne, Oklahoma, and to wooded bottoms of Ohio and Mississippi rivers in southern Illinois; but separated from Gulf coast by a narrow belt occupied by *littoralis*. Vertical range from a little above sea level to about 800 feet in Alabama, entirely in the Lower Austral Zone." (Nelson)

Coast Swamp Rabbit.—*Sylvilagus aquaticus littoralis* Nelson.

Resembling typical *aquaticus* in size, but darker and redder. Total length, 21 inches; tail vertebræ, 2.8 inches; hind foot, 4.3 inches; ear from notch, 2.6 inches. Upperparts reddish brown with heavy wash of black; rump brighter (rufous) than back; tail above, like rump, below, white; nape, legs and feet rich cinnamon-rufous. Found in "A narrow belt of swamps and marshes along the Gulf coast, nearly if not entirely within upper limits of tidewater, from Bay St. Louis, Mississippi, west through Louisiana to Matagorda Bay, Texas. Vertical range below 50 feet altitude, wholly within the Lower Austral Zone." (Nelson.)

* * * * *

The Cottontail Rabbit is one of the most widely known and recognized of North American mammals. Although the genus *Sylvilagus* ranges over a great part of North America and there are a great many different species and subspecies, nearly everywhere the white underside of the tail is a trade

mark that cannot fail to be recognized. There are members of this genus which do not have tails pure white below, but these Rabbits are referred to here as Brush Rabbits or Swamp Rabbits, although they may be known locally as Cottontails where no "real" Cottontail occurs.

This animal is, no doubt, the most popular of all our small game mammals, and it is a favorite with hunters ranging from small boys to experienced sportsmen. It is the proud bag of the boy's first kill and the stop-gap of the disappointed bird-hunter. In spite of this army, the Cottontail is remarkably successful in most regions and holds its own with a minimum of encouragement. In many regions of the West it flourishes in spite of open seasons the year around, and may become an economic pest, although not to the same extent as the Jack Rabbits.

In forested regions, Cottontail Rabbits frequent open brushy areas among the trees, coming out to feed in the late afternoon or early morning about the edges of fields or meadows. They are seldom seen in heavy stands of trees where there is no underbrush or an occasional glade. In the plains districts the Cottontails may be anywhere, but are commonest, of course, where green vegetation affords them the most abundant food.

The Pacific Coast Brush Rabbits are very similiar to the Cottontails in habits although, as their name would suggest, they are less often encountered in the open and prefer a heavy-brush locality. The Swamp Rabbits are so named because of a preference for a more specialized habitat and are found in the swampy or marshy districts in the southeastern United States. These Rabbits may be encountered either more or less in the swamps or on higher ground between the sunken areas.

Cottontails are very prolific and, in the warmer parts of their range, young animals may be found during any month of the year. Farther to the north the rearing of young is suspended during the winter months, but several broods a year is the general habit for this genus. Young Cottontails are able to take good care of themselves at an early age and are almost as difficult to run down and catch as the adults. The number of young in a litter varies from three to seven, with four as an average number.

These Rabbits may become quite abundant at times, but never seem to reach the numbers attained by the Jack Rabbits or the Hares in the North. The Cottontail is the host for many forms of parasitic life, the commonest being ticks and the larvæ of bot-flies.

Although the gait of the Cottontail appears to be rapid as it dashes for safety, it has none of the specializations for speed seen in the Jack Rabbits, and it places its chief reliance in cover. In the brush it is able to double or change direction so abruptly that it can generally escape from a Dog long enough to get under a brush-pile or some other obstruction which baffles the larger animal.

Genus *Brachylagus*¹

Dentition: Incisors, $\frac{2}{1}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{2}$; Molars, $\frac{3}{3}$ = 28.

Idaho Pigmy Rabbit.—*Brachylagus idahoensis* (Merriam)

General Description.—Smallest of the American Rabbits. Form like that of a small Cottontail Rabbit; ears short and broad; tail short, without white underside; summer pelage brownish gray; winter pelage vinaceous.

Color.—Sexes alike in color; noticeable seasonal variation.

Summer.—Upperparts.—Back brownish gray; feet and legs warm buffy; sides paler than back; nape ochraceous; tail above and below, buffy; ears like nape over posterior half, dusky grayish on anterior half; legs and feet ochraceous buff.

Underparts.—White, which may be washed with buffy in some individuals; throat buffy.

Winter.—Pelage long and very soft, lax; color above, pinkish drab, washed with gray on sides; ears cinnamon-buff behind, like top of head on anterior half, with narrow black edging near tip, ears inside with long, whitish hairs; forelegs and feet deep cinnamon-buff, hind feet slightly paler; tail like back above, somewhat grayer below; underparts white; throat buffy.

Measurements.—Total length, 11–12 inches; tail vertebrae .8 inch; hind foot, 2.9 inches, ear from notch, 1.6 inches.

¹ See footnote, page 478.

IDAHO PIGMY RABBIT

Geographical Distribution.—"Sagebrush plains of southern Idaho, southeastern Oregon, extreme northeastern California, and northern and central Nevada. Vertical range from about 4,500 to over 7,000 feet altitude in Nevada; zonal range, mainly Upper Sonoran, but extending into the lower border of Transition Zone." (Nelson)

Food.—Foliage of shrubs, grass, and plants.

Enemies.—Presumably the same as those of Cottontail Rabbits,—Hawks, Owls, Weasels, Coyotes, et cetera.

Species and Subspecies of the Genus *Brachylagus*

Only the one species of this genus is known.

* * * * *

The Pigmy Rabbit looks very much like a small Cottontail Rabbit, and since this animal lives in thick brush where it is difficult to get more than a glimpse of the creature, one is very likely to confuse the two genera. The best field character for distinguishing *Brachylagus* from *Sylvilagus* is the difference in tails, the Pigmy Rabbit showing no conspicuous white underside to the tail as it scampers away. Young Cottontail Rabbits will often pass for Pigmy Rabbits until they flash the white tail. The gait of *Brachylagus* differs from that of *Sylvilagus* in that the former runs closer to the ground with less bounding.

For a long time this species was very rare in collections and but little was known of its habits and distribution. Now we have learned that it is not especially rare when one knows where to look for it. The Pigmy Rabbit lives in thick clumps of Sagebrush (*Artemisia*) and Rabbit-brush (*Chrysothamnus*) where it has no trouble in escaping notice. Its coloration is protective and it generally lies close until almost stepped upon, when it scurries noiselessly away and is lost to sight in a twinkling.

Because the first specimens of Pigmy Rabbit were trapped in old Badger holes, it has been supposed that this species is a dweller in burrows which might, in a measure, account for it being so seldom seen. In eastern Oregon, I found it behaving exactly as the Cottontail Rabbits, and, while I saw many, I rarely saw one run down a hole, although they do enter old burrows on occasion, just as the Cottontails do.

The Pigmy Rabbit is peculiar among the small American

Rabbits in its assumption of a distinct winter pelage. There is a marked difference between the coats of summer and winter and no member of the genus *Sylvilagus* (Cottontails) displays such seasonal variation.

This small Rabbit has rather a restricted range and is not found outside of the area which takes in portions of California and Oregon, where they meet with Idaho and Nevada. In searching for the Pigmy Rabbit I have had the best success by looking up the patches of Sagebrush where the yellow Rabbit-brush was conspicuous and then hunting very, very slowly.

The number of young to a litter is three or four.



Order ARTIODACTYLA. Even-toed Hoofed Mammals

Mammals of large size; feet digitigrade; third and fourth digits largest; digits with hoofs; molars with broad crowns and ridged grinding surface; clavicle absent; herbivorous in diet; terrestrial in habit.

Family **Tayassuidæ**. Peccaries

Small, pig-like ungulates with peculiar dentition; incisors rooted; upper canines pointing downward and with posterior edges developed into keen cutting edges; snout pig-like; forefeet with four toes, hind feet with three toes; stomach complex; cæcum present.

Genus **Pecari**

Dentition: Incisors, $\frac{2}{3}$; Canines, $\frac{1}{1}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 38.

Peccary.—Pecari angulatus

and subspecies

Names.—Peccary; Collared Peccary; Wild Pig; Javeline; Musk-hog. Plate XLI.

General Description.—A small, pig-like ungulate. Head pig-like, muzzle long, ears fairly large; neck thick; body compact; limbs fairly short; pelage long and coarse; small, sharp tusks present but not projecting noticeably beyond lips; a well-developed, odorous gland on top of rump; tail very short; mane of long hairs, erectile, from crown to rump.

Color.—Sexes colored alike; no pronounced seasonal variation.

Everywhere grizzled black and grayish, with yellowish wash on cheeks and a more or less conspicuous grayish collar running from throat up to shoulder; feet blackish.

Young yellowish brown grizzled with black, with black stripe down back; underparts yellowish gray.

Measurements.—Sexes of equal size. Total length, about 36 inches; tail vertebræ, .5 inch; hind foot, 8 inches; weight, 45 to 50 pounds.

Geographical Distribution.—Southwestern Texas, southeastern New Mexico, and southern Arizona.



FIG. 110. Peccary

Food.—Practically omnivorous; nuts, roots, fruits, insects, worms, reptiles, toads, etc.

Enemies.—Jaguar, Cougar, and Wolf.

Species and Subspecies of the Genus *Pecari*

Texas Peccary.—*Pecari angulatus angulatus* (Cope).

As described. Found in southwestern Texas and southeastern New Mexico.

Sonoran Peccary; Yaqui Peccary.—*Pecari angulatus sonoriensis* (Mearns).

Differing from the Texas Peccary "in being larger, with relatively larger ears and feet, and paler colors. The peccary of the Lower Rio Grande is blackish, while that of Sonora and Arizona is grayish, with a sharply-contrasting, black dorsal stripe." (Mearns) Total length, 37 inches; tail vertebræ, 1.5 inches; hind foot, 8 inches; height at shoulder, 24 inches. Found from southern Arizona southward.

* * * * *

The Peccary is the only native North American mammal which has any claim to the title "Wild Pig." The Peccaries do resemble Pigs in appearance, but belong to a separate and

distinct family, so that even their claim is a weak one. In some sections domestic swine have become feral and may go by the name of Wild Pig.

The Peccary is found in a very limited area along the Mexican border where it reaches the northern limit of its distribution. The group is a widely ranging and important one to the south and goes far down into South America.

In the United States this animal frequents the valleys and plains where dense thickets of cactus and mesquite afford it shelter. It may also work up the mountain slopes into the timber, but they do not roam the open plains. Peccaries usually travel in small bands and have the reputation of being dangerous if molested. There are authentic cases known where the Collared Peccary has "treed" man, but under most circumstances these animals are shy and anxious to escape from man. The larger White-lipped Peccary of the south is, perhaps, more deserving of this reputation.

The Collared Peccary feeds mostly in the morning and along toward evening and during midday seeks a retreat in the brush. When alarmed the bands dash off at a rapid pace. This animal squeals and grunts in a pig-like fashion and has such a strong, peculiar odor, because of the dorsal gland, that it may be detected at some little distance by even such a poor organ as the human nose. I once discovered a band in Panama by scent some time before the animals themselves came close enough to be seen.

The Peccary has but two young at a birth and they are reddish in color, quite different from their parents in appearance.

Family Cervidæ. Deer

Males with deciduous, solid antlers (females also, in some cases) which grow from permanent bases or pedicles on the frontal bones; upper incisors wanting; upper canines may or may not be present; second and fifth toes small but usually present.

Subfamily Cervinæ

Genus Cervus

Dentition: Incisors, $\frac{2}{4}$; Canines, $\frac{1}{6}$; Premolars, $\frac{2}{8}$; Molars, $\frac{2}{8}$ = 34.

Wapiti.—*Cervus canadensis*

and related forms

Names.—Wapiti; Elk; American Wapiti; American Elk; American Stag. Plate XLII.

General Description.—A very large Deer of typical structure, the males with large, widely-branching antlers having well-developed brow and bez-tines; muzzle naked and moist;



FIG. III. Wapiti

anteorbital facial gland prominent; neck maned; tail short; metatarsal glands present; canine teeth present in upper jaw, much larger in males than in females; large, light-colored rump patch present; young spotted with white.

Color.—Sexes slightly different in color.

Males.—Head and neck dark chestnut-brown; sides and back yellowish gray to brownish gray; a large patch on rump straw-colored; tail like rump patch; legs dark brown; underparts blackish; white patch between hind legs.

Females.—Less strongly marked than males.

Immature.—Yellowish spotted with white.

Winter pelage longer and colors a trifle lighter than in summer.

Measurements.—Males much larger than females. Males, total length, about 115 inches; tail vertebræ, 6-8 inches; hind foot, 26 inches; height at shoulder, 60 inches; weight 700-1000 pounds maximum. Females, total length, about 88 inches; tail vertebræ, 4.5 inches; hind foot, 25 inches; height at shoulder, 56 inches; weight about 500-600 pounds.

Antlers of male in prime carry from five to seven, rarely more, points and measure up to 66 inches along the beam, following curves, and a spread of 60 inches, for a record head.

Geographical Distribution.—Western North America, chiefly in the Rocky Mountain district and far western states; formerly over most of the United States and part of southern Canada.

Food.—Grasses, twigs, leaves, green plants, etc.

Enemies.—Cougar, Bear, Wolf, and Coyote.

Species and Subspecies of the Genus *Cervus*

American Wapiti.—*Cervus canadensis canadensis* (Erxleben).

As described. Found in the Rocky Mountain region from northern New Mexico and Colorado north into Alberta.

Manitoba Wapiti.—*Cervus canadensis manitobensis* Millais.

Darker in color than typical *canadensis* and with smaller antlers. Found in Manitoba and Saskatchewan.

Western Wapiti; Roosevelt Wapiti; Olympic Wapiti.—*Cervus canadensis occidentalis* (Hamilton Smith).

Large in size and very dark in color. Found on Vancouver Island, in the Olympic Mountains of Washington, and parts of western Oregon and California.

Arizona Wapiti.—*Cervus merriami* Nelson.

Darker on nose and with more reddish on head and legs than *canadensis*, but paler than *occidentalis*; antlers with straighter tip than *canadensis*. Formerly found in the White Mountains of Arizona and the Mogollon Mountains of western New Mexico, but now probably extinct.

California Wapiti; Dwarf Elk.—*Cervus nannodes* Merriam.

Much smaller than other American Wapiti, shorter-legged, paler in color and with more white on ears. "Size small; legs short; coloration pale; fur of ears soft, almost woolly; white rump patch small and narrow; front of legs and feet bright golden fulvous; back and flanks varying from buffy

gray slightly washed with fulvous, to grizzled buffy whitish." (Merriam) Found only in Kern County, California.

* * * * *

The Wapiti is the largest of the North American Deer, except for the Moose. It is closely akin to the Red Deer of Europe, the Stag, and there are Wapiti to be found in Asia. It is unfortunate that the early settlers applied the name of Elk to the American Wapiti which in no way resembles the Old World Elk, a true Moose. "Wapiti" is said to be the name used for our animal by the Shawnee Indians.

The original range of the Wapiti included the greater part of North America between the parallels of 35° and 50° and almost to 60° along the eastern slopes of the Rockies. From the earliest times, this animal is mentioned in the accounts of the explorers and pioneers to whom it was naturally a noteworthy beast, because of its size and also its importance as a food supply. With the settlement of North America, this large Deer has rapidly disappeared, especially in the eastern section of the continent. Today there are no descendants of the original eastern Wapiti east of about 105°; animals from the West have been brought East to restock certain areas.

The principal stronghold of the Wapiti at this time is the Yellowstone National Park where the herds are estimated at 40,000. Other regions where wild Wapiti occur in fair numbers are in Montana, Idaho, Washington, and Manitoba.

Wapiti feed up into the mountains during summer and scatter out over a wide range. In the winter they come down from such regions of heavy snowfall and seek more sheltered feeding grounds on the lowlands. The restriction of open range, the erection of fences, the competition of domestic stock, and the hunting of the bull Elk for the canine teeth, formerly used as the emblem of a fraternal order, have all operated to limit the numbers of Wapiti.

Today this animal is well protected by law in most places. Open seasons when it may be shot are short and the National Government is doing much to conserve this great game mammal.

In behavior the Wapiti is typically deer-like. The bulls are polygamous and, during the fall, call or "bugle" a challenge to one another. The velvet has been rubbed from the antlers by this time and the hard, polished prongs are formidable.

able weapons of offense. In these fights of the bulls for the cows, the vanquished one usually knows when he has had enough and takes the first chance to leave the field, but sometimes the combat has a fatal ending; and, on rare occasions, the horns of the fighting pair become so firmly interlocked that the tired animals can not break them apart, and both die.

The young are born in May or early June and while but one is the usual number, there may be two or, rarely, three to a mother. They are spotted like the other North American Deer and keep this dappled coat until the new autumn pelage comes in

Genus *Odocoileus*

Dentition: Incisors, $\frac{9}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

Virginia Deer.—*Odocoileus virginianus*

and related forms

Names.—Virginia Deer; White-tailed Deer; White-tail.

General Description.—A large, gracefully-formed Deer, the male with antlers which are shed in the spring, the female hornless. Tail rather long for a Deer, somewhat bushy, conspicuously white on the underside; antlers of full-grown male of good size, no brow-tines, the branches directed forward; hair long and slightly brittle in character. Plate XLIII.

Color.—Sexes alike in color; noticeable seasonal variation.

Summer.—Upperparts reddish brown to ochraceous buff, band across nose, ring about eye, and inside of ear whitish; spot on each side of nose blackish, tail dusky. Underparts: belly, throat, and inside of legs whitish; tail conspicuously white.

Winter.—Like summer but grayish to grayish brown instead of reddish above; hair longer and pelage heavier than in summer.

Young.—Reddish brown or rufous, with white spots, the spots persisting until the end of the fourth or fifth month.

Measurements.—Males: Total length, 70–77 inches; tail vertebræ, 7–11 inches; hind foot, 20 inches; height at shoulder, 36–40 inches; weight, 150–300 pounds, occasionally heavier; antlers of prime adult normally 5 or 6 points. Females some-

what smaller than males; weight of average doe, 100-150 pounds, depending on the locality.

Geographical Description.—Found from the Atlantic seaboard to the Great Plains, and from the Gulf of Mexico to about 43° north latitude.

Food.—Many species of grasses, leaves of shrubs, trees, and aquatic plants, sometimes acorns.

Enemies.—Cougar; Wolf; Lynx; Wolverine.

Species and Subspecies of the Subgenus *Odocoileus*

Virginia Deer.—*Odocoileus virginianus virginianus* (Boddært). As described above. Found in the eastern United States north to southern New York (?) and south to Florida; limits of range uncertain.

Northern White-tailed Deer.—*Odocoileus virginianus borealis* (Miller).

Resembling typical *virginianus* but averaging larger in size; antlers more widely spreading; redder in summer pelage; usually a conspicuous fringe of white hairs between toes. Found in New England, northern New York and west to Ontario, northern Wisconsin, and Minnesota; limits of range unknown.

Key Deer.—*Odocoileus virginianus clavium* Barbour and Allen.

"Smallest of the eastern races of Virginia Deer, colors paler, teeth smaller than in the mainland races." (Barbour and Allen) Found on Keys from Big Pine Key to Boca Chica, Florida.

Louisiana White-tailed Deer.—*Odocoileus virginianus louisianæ* (G. M. Allen).

Differing from typical *virginianus* in paler color; skull long and slender; antlers heavy. Found in Louisiana and the Gulf States.

Plains White-tailed Deer; Western White-tailed Deer.—*Odocoileus virginianus macrourus* (Rafinesque).

Resembling typical *virginianus* but paler. Reddish brown above, in summer; yellowish gray mixed with black, in winter. Total length, 90 inches; tail vertebræ, 12 inches. Found from the Dakotas, Nebraska, and Kansas west to the Rocky Mountains; from Alberta in the north to north New Mexico in the south.

Texan White-tailed Deer.—*Odocoileus texanus* (Mearns). Smaller in size than *virginianus*, pale in color, short of leg; horns small and strongly incurved. Summer pelage reddish; winter pelage pepper-and-salt (mixed black, yellowish white and gray), with blackish area from crown to root of tail. Total length, 63 inches; tail vertebræ, 10.5 inches;

hind foot, 17.2 inches; height at shoulder, 35 inches. Found in the Rio Grande section of Texas.

Florida White-tailed Deer.—*Odocoileus osceola* (Bangs).

About the size of the Texan White-tail but much darker; considerably smaller than *virginianus*. Considered by Barbour and Allen to be a subspecies of *virginianus*. Found in Florida.

Sonora White-tailed Deer; Arizona White-tailed Deer.—

Odocoileus couesi (Coues and Yarrow).

Much paler and smaller than typical *virginianus*; pelage rather fine for a Deer. Winter pelage pale brownish gray, with darker vertebral area; sides pale drab gray; yellowish brown about axillæ and thighs; pale brownish on chest; underparts white. Summer pelage brownish fawn color. Weight of fat buck about 80 pounds. Total length, 60 inches; tail vertebræ, 9.5 inches; hind foot, 16.6 inches. Found in southwestern New Mexico and southern Arizona.

Oregon White-tailed Deer; Douglas White-tailed Deer.—

Odocoileus leucurus (Douglas).

Resembling *macrourus*, with black markings greatly reduced and much white. By some authors considered to be indistinguishable from *macrourus*. Found along the lower Columbia River, Oregon.

* * * * *

The Virginia or White-tailed Deer, often called simply "White-tail," is without doubt the best known of the American large game mammals. Not only is it well known to the sportsman, but it is a familiar sight to the camper or any one who has passed any length of time in the undeveloped sections of the eastern United States. Indeed, this Deer adapts itself so well to the ways of civilization that it is common or even abundant at no great distance from some of our most thickly settled regions.

The sight of a White-tailed Deer bounding away, with the snowy white tail or "flag" flashing, is one of the most stirring spectacles one can imagine and quickens even the most indifferent pulse. This animal has played probably the most important mammal role in the history of this continent. It was this Deer that furnished the principal food supply of early settlers and pioneers and their garments were made of buckskin. The hunting of the Virginia Deer taught the early Americans woodcraft, and the continental riflemen learned their marksmanship at the cost of the Virginia Deer and the Squirrel.

Instead of decreasing in numbers with the inroads of civil-

ization along our Atlantic seaboard, the Virginia Deer in many places not only has held its own but has even increased. Today it is not exaggerating conditions to state that the total White-tailed Deer population of the United States is probably as great as it ever was. In spite of the great number killed annually by sportsmen, many thousands, this species shows no immediate prospect of extermination. This state of affairs is due to two factors, the wise policy of conservation adopted by most states in their game laws and to the adaptability of the Deer itself.

The cutting down of vast primeval forests, and the subsequent springing up of second growth vegetation, has added much territory to the natural range of the Virginia Deer. This Deer does not prefer dense stands of primeval forest, but delights in openings and glades interspersed with enough timber and shrubbery to give it adequate cover. The abandonment of worked-out New England farms has provided this animal with very acceptable homes and feeding grounds.

The doe has from one to three fawns at a birth, but as a general rule she has twins. They are born from late May to early July.

The bucks shed their antlers any time from late December to March. The new antlers appear from two to six weeks after shedding, and grow rapidly as the spring feed improves. By late summer they have attained their full size, but are still in the velvet. In September the bucks begin to rub the velvet from the antlers which are now hard and insensitive.

Mating takes place in late October, November and early December.

Subgenus *Eucervus*

Black-tailed Deer.—*Odocoileus hemionus*

and related forms

Names.—Mule Deer; Black-tailed Deer. Plate XLIV.

General Description.—Rather heavier in build and more robust than the White-tailed Deer; ears larger and tip of tail black instead of white; antlers with tines pronged in contrast to the single, undivided tines of the White-tailed Deer; metatarsal gland unusually large; gait high and bounding.

Color.—Sexes alike in color.

Summer.—Upperparts: From tawny to yellowish brown, with a large patch of white on rump and about tail; a dark patch on forehead; inner ear grayish white; tail white except for tip which is black.

Underparts.—Darker than above, blackish; inner side of legs and throat white; tail naked on underside.



FIG. 112. Black-tailed Deer

Winter.—Pattern of coloration about as in summer pelage, but dark gray instead of brownish.

Young.—General pattern brownish yellow, irregularly spotted with dull white.

Measurements.—Males: Total length, 68 inches; tail vertebrae, 7 to 8 inches; hind foot, 19.5 inches; height at shoulder, 42 inches; height of ear above crown, 9.5 inches; weight of average buck, 150 to 200 pounds, with unusual weights exceeding 400 pounds. Females: Smaller than bucks, length about 48 inches.

Geographical Distribution.—In the plains, foothills, and mountains from central Alberta, central Manitoba, and eastern British Columbia to Mexico, and from about 95° longitude southwest to California.

Food.—Grass, twigs, foliage of trees and shrubs, fruits, plants, and acorns.

Enemies.—Cougar; Wolf; and for young Deer—Bobcat, Coyote, and Golden Eagle.

Species and Subspecies of the Subgenus *Eucervus*

Mule Deer; Rocky Mountain Mule Deer; Black-tailed Deer.—

Odocoileus hemionus hemionus (Rafinesque). Plate XLIV.

As described above. Found from the Dakotas through Nebraska, Kansas and Oklahoma west to eastern British Columbia, Washington, Oregon, and California.

Desert Mule Deer; Burro Deer.—*Odocoileus hemionus eremicus* (Mearns).

Large, very much paler than typical *hemionus*, horns heavy. Upperparts pale drab gray. Found in the western desert tract of the United States, on both side of the Colorado River and about the head of the Gulf of California.

California Mule Deer.—*Odocoileus hemionus californicus* (Caton).

Noticeably smaller than the typical form. Upperparts cinnamon in color, with a dark stripe running down the back onto upper surface of tail. Total length, 56 inches; tail vertebrae, 7 inches; hind foot, 18 inches. Found from southern California into northern Lower California.

Mexican Mule Deer.—*Odocoileus hemionus canus* Merriam.

Smaller, paler, and grayer than typical *hemionus*. Total length, 63 inches; tail vertebrae, 10.5 inches; hind foot, 17 inches. Found in southwest Texas, New Mexico, Arizona, and northern Mexico, from Sonoran to Boreal Zone.

Minnesota Black-tailed Deer; Brush Deer.—*Odocoileus virgultus* (Hallock).

Resembling typical *hemionus* but with much black on underparts, and antlers comparatively small; smaller in size. Found in northwestern Minnesota, southeastern Keewatin, and Manitoba.

Crook Black-tailed Deer.—*Odocoileus crooki* (Mearns).

Only two specimens of this Deer have ever been taken and they are suspected of being hybrids between the Black-tailed and White-tailed Deer. These specimens come from the Dog Mountains, New Mexico, and Bill Williams Mountain, Arizona. The type specimen is about the size of the Columbian Black-tail (total length, 57 inches) and resembles it in characters of antlers, tail, and metatarsal gland, but is like the Mule Deer in having large ears, black mark on

forehead, and white buttocks. The underside of the tail is white like that of a White-tailed Deer.

Columbian Black-tailed Deer; Coast Deer.—*Odocoileus columbianus columbianus* (Richardson). Plate XLIV. (Read Columbian Black-tailed Deer for upper figure).

Somewhat smaller than *hemionus*, with shorter ears and shorter metatarsal gland; antlers like those of *hemionus*; tail black above. Summer pelage reddish to reddish yellow above; in winter brownish gray mottled with black, with dark dorsal line, and blackish area on top of head; white on chin, upper throat, underside of tail, and inguinal region; dusky or sooty on chest and anterior underparts; upperside of tail black. Total length, 66 inches; tail vertebræ, 9 inches; hind foot, 19 inches. Found in the Pacific Northwest from northern California to British Columbia and from the Sierra Nevada and Cascade Mountains to the Pacific Ocean.

Southern Black-tailed Deer.—*Odocoileus columbianus scaphiotus* Merriam.

Resembling typical *columbianus* but ears much larger and broader, and color paler. Upperparts (winter) grizzled gray. Total length, males, 58 inches; tail vertebræ, 5.5 inches; hind foot, 18 inches. Found in the coast region of California from San Francisco Bay southward.

Sitka Black-tailed Deer.—*Odocoileus columbianus sitkensis* Merriam.

Smaller than typical *columbianus*, with shorter ears and black on upperside of tail restricted to terminal half. Total length, 60 inches; tail vertebræ, 5 inches; hind foot, 17.5 inches. Found in southeastern Alaska and islands in the Sitka region.

* * * * *

The Black-tailed Deer may be distinguished from the White-tailed Deer, or Virginia Deer, not only by the difference in color of the tail, but also by the much larger ears of the former, as well as by its larger metatarsal gland, high, bounding gait, and dichotomous antlers. The ranges of these two types of Deer overlap to a considerable extent, but usually the two prefer different environments and thus keep to themselves.

The Black-tail is at home in broken country, open plains, or brushy, partly wooded terrain and does not care for heavy forest or swampy regions. It moves about with the season, feeding during the summer well up into the hills and mountains and spending the winter in the more sheltered lowlands, often traveling a hundred miles or more to do this. During the winter the Deer congregate in good-sized bands, but when

the snow melts in the spring and the animals are free to move about, they scatter and are usually seen as individuals or as small parties of two or three. In the summer the bucks and does do not mingle, but the sexes keep by themselves. The bucks may be found in small bands up to ten in number.

The Black-tailed Deer when alarmed or pressed for speed runs with a peculiar high-bounding gait, taking off from all four feet and landing on all fours. Although spectacular, this gait does not cover ground as rapidly as the rush of the White-tailed Deer. The real value in such a gait is correlated with the broken country in which these bounding Deer live, where such a method of progression carries them safely away from enemies much fleetier on the plains but incapable of great leaps over rough country. The Black-tail does not show an extensively white tail as it runs, it does not carry it aloft as does the Virginia Deer, but lets it hang.

The Black-tailed Fawns are born in late May or June. The number varies from one to three, but the usual number is two. The young spend the summer, winter, and spring with the mother and she is a devoted parent. While they are very young and helpless the mother hides them and goes away to feed, returning at long intervals to nurse them. The mating season is usually November and December.

Genus *Alces*

Dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

Moose.—*Alces americana*

and related forms

General Description.—The largest of the American Deer or antlered ungulates, heavy and ungainly in appearance, almost grotesque in comparison with the Virginia Deer. Males have exceedingly broad, heavy, palmate antlers; females without antlers. Muzzle broad, pendulous and inflated; nasal pad hairy except on extreme lower portion; ears large; throat with a hanging growth of skin and long hair called the "bell"; height at shoulders greater than at rump; tail short; hoofs long and pointed; lateral hoofs well developed; color very dark. Plate XLII.

Color.—Sexes colored alike.

Winter.—General tone of upperparts from blackish brown to black; some gray on muzzle and face. Underparts much the same color as upperparts, but lower belly and lower legs paler in color, brownish gray.

Summer.—Very similar in pattern to winter pelage but somewhat lighter in color and legs washed with tawny gray.

Young.—Not spotted like fawn of the Virginia Deer; reddish brown in color.



FIG. 113. Moose

Measurements.—Males: total length, 102–108 inches; tail vertebrae, 2.5 inches; hind foot, 31 inches; height at shoulder, 66–78 inches; average spread of antlers, prime adults, 52–58 inches; maximum or record antlers, 65–78 inches in spread; weight from 900 to 1400 pounds. Females: much smaller, about three-quarters the size of males.

Geographical Distribution.—Found more or less commonly throughout British America and the northern United States from Maine to North Dakota and south in the Rocky Mountains to Yellowstone Park. In former years the Moose was known as far north in New England as Massachusetts.

Food.—Particularly fond of aquatic plants, but feeding also on foliage and twigs of shrubs and trees.

Enemies.—Wolves; Bears; and Cougars.

Species and Subspecies of the Genus *Alces*

Common Moose; American Moose.—*Alces americana americana* (Clinton).

As described above; the typical form of the group. Found from the northern United States (east of the Rocky Mountains) north to Hudson Bay and northwest beyond the Arctic Circle.

Shiras Moose.—*Alces americana shirasi* Nelson.

Smaller than typical *americana* with pale brown along the back, pale ears, and small hoofs. Found in the Yellowstone National Park region of Wyoming, in Montana and Idaho; limits of range unknown.

Lydekker Moose.—*Alces columbæ* Lydekker.

The original description is based upon two mounted heads which are said to differ from other Moose in having a peculiarly shaped bare patch on muzzle which sends off an arm onto each nostril (this patch is triangular in *americana* and T-shaped in *columbæ*). Some doubt exists as to whether these heads came from British Columbia or Ontario. Probably *columbæ* is indistinguishable from *americana*.

Alaska Moose.—*Alces gigas* Miller.

Much larger and blacker than the Common Moose. This species is much the finest of the genus and reaches superb dimensions. Total length up to 122 inches; height at withers, 81–92 inches; weight up to 1700 or 1800 pounds. Found on the Kenai Peninsula.

* * * * * * *

The Moose is the grandest of all the North American Deer. Although it is almost a caricature of the graceful forms of the smaller Deer, and the heavy muzzle, the clumsy body-shape (high at the shoulders), and the somber coloration without relieving touch of contrasting white, certainly are not calculated to win a prize for beauty, there is a suggestion of massive strength and irresistible vigor about a Moose that is certain to arouse a feeling of admiration. A bull Moose crashing through brush and fallen timber, splashing thunderously through the shallows of a northern lake, seems to be moving as if nothing could stop him.

The Moose is the largest of all the Deer and is found in both the Old and New Worlds. In Europe it is known as the Elk and this fact is a good reason for using the name Wapiti for our large Deer, *Cervus canadensis*, which so many North American sportsman call Elk.

Moose prefer regions where lakes and streams furnish them with the aquatic plant life which forms such an important part of their summer diet and where forests and shrubbery insure a winter food supply. In the United States they are found only in a few states along the Canadian border and in a narrow strip down the Rockies; the greatest part of their range lies north of 50° north latitude.

Like other Deer, the Moose may be active at any hour but usually the best times for observation are early in the morning or from late afternoon on into evening. The large size of the animal makes it conspicuous when moving, and during the fall, the mating season, it is very noisy and attracts attention by calling and breaking of brush. The call of the bull Moose is a hoarse bellow or deep grunt to which the cow Moose responds by a longer call, which is difficult of description but might be characterized as an expressive blatting bellow in a base register. Seton describes it as "Moo-waugh-yuh" on three notes, the second one being prolonged. When the bull receives an answer, either from a cow, or another bull challenging to combat, he often smashes his way through brush or dead timber, with a fine disregard for whoever may hear him, and may stop often to thrash the shrubbery with his antlers. At other times he may move so quietly that no sound of approach is heard. Hunters can call a bull Moose by imitating the bellow of the cow and decoy the animal within easy rifle shot. During most of the year Moose do not call, the season of vocal activity being only two or three weeks, and usually from the middle of September into October. Rarely a Moose call may be heard as late as December.

Moose browse on twigs and shrubbery and also spend much time in the water searching for the water plants which grow in the shallow northern lakes. Sometimes they get these plants by submerging only the head and part of the neck, but if the water is deeper they may dive and be completely under water.

The cow Moose has one calf her first season and thereafter two, rarely three. The young are born in late May and remain with the mother until the next spring.

Genus *Rangifer*

Dentition: Incisors, $\frac{2}{4}$; Canines, $\frac{1}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 34.

Caribou.—*Rangifer caribou*

and related forms

Names.—Caribou; Reindeer. Plate XLVI.**General Description.**—A large Deer with slightly palmated antlers on both sexes; muzzle hairy; anteorbital facial gland fairly prominent; neck maned on underside; ears short; tail short; tarsal glands but no metatarsal glands; hoofs broad,

FIG. 114. Caribou

flat, deeply cleft; accessory hoofs long; upper canines sometimes absent; pelage full, hairs of pith-like structure; young not spotted with white; habitat northern.

Color.—Sexes colored very much alike, marked seasonal variation may or may not occur.

General color warm brown, with yellowish white on neck, belly, small patch including tail and buttocks, and band about each foot; face and legs rather darker brown (autumn pelage).

In winter the general tone is somewhat lighter; grayish

brown, than in summer. Young like adults, with some faint indications of pale spotting.

Measurements.—Males larger than females. Males, total length, about 72 inches; tail vertebræ, 4 inches; height at shoulder, 42–48 inches; weight from 200–300 pounds. Females weight, 150–250 pounds.

Geographical Distribution.—Most of North America from about 45° (in the east) northward; in the west, south in the Rockies about to the Canadian boundary.

Food.—Foliage of small trees, shrubs, and plants, willow, birch, mosses, lichens, grasses, etc.

Enemies.—Wolves and Bears.

Species and Subspecies of the Genus *Rangifer*

The Caribou fall more or less naturally into several large groups, the typical numbers of which may be easily distinguished from one another, although there are border-land forms which are disturbing because they combine the characters of two groups.

Woodland Caribou

Characterized by large size, heavy antlers with five or six palmations and the beam somewhat flattened, and color usually dark.

Woodland Caribou.—*Rangifer caribou caribou* (Gmelin).

As described. Found in extreme northeastern United States and southeastern Canada, as far north and west as Great Slave Lake, and even recorded as far north as 68°, in forested sections; limits of range unknown.

Richardson Caribou.—*Rangifer caribou sylvestris* (Richardson).

Very much like typical *caribou* but darker on head and neck and very much darker on ears, back and sides of neck, the hairs brown to the roots. Found along the southwestern shores of Hudson Bay; limits of range unknown.

Newfoundland Caribou.—*Rangifer terrænovæ* Bangs.

Larger than *caribou*, much lighter in color and with antlers low, widely spread and much forked. Color in fall pelage, drab grayish brown above; nearly pure white below; neck soiled white. Found in Newfoundland.

Mountain Caribou

Distinguished by very large size, dark or blackish coloration, and great antlers.

Mountain Caribou.—*Rangifer montanus* Seton-Thompson.

Very much larger than the Woodland Caribou—reaching weights of 500–600 pounds. Color above, deep, glossy, blackish brown, nearly black on legs; dull grayish brown on neck; grayish white on belly, buttocks, and underside of tail; narrow white band above each hoof. Total length, 95 inches; tail vertebræ, 5 inches; hind foot, 26 inches; height at shoulder, 47 inches. Antlers reach 61 inches in length along the beam. Found in the Selkirk Range of British Columbia south in the Rockies to Montana, Idaho, and Washington, north to meet the range of *osborni*.

Osborn Caribou.—*Rangifer osborni* Allen.

A very large, if not the largest, Caribou, reaching a weight of 700 pounds and a height at shoulder of nearly 60 inches; antlers enormous, massive, and flattened. Upperparts clove-brown, darkest on head and back, and blackish brown on breast and legs; neck brownish gray, lightest on sides; underparts grayish white to pure white on belly and inside of hind legs; a narrow white band above each hoof. Total length, 90 inches; tail vertebræ, 6 inches; hind foot, 25.5 inches. Found in the Cassiar Mountains of British Columbia north to the Yukon district.

Rocky Mountain Caribou.—*Rangifer fortidens* Hollister.

Probably the largest of all the Caribou; antlers thickset and heavily palmated; main beam nearly straight; color very dark, from rich seal-brown to black; white on rump, on edges of tail; grayish brown on neck; females said to often lack antlers. Total length, 95 inches; tail vertebræ, 6 inches; hind foot, 27 inches. Found in the Mt. Robson region of British Columbia and Alberta.

McGuire Caribou.—*Rangifer mcguirei* Figgins.

Resembling *osborni* and *stonei* but differing in type of antlers; general coloration light brown; sides drab; legs darker, sides of neck and throat whitish. Total length, 100 inches; tail vertebræ, 9 inches; hind foot, 26 inches. Found in the vicinity of the Alaska-Yukon boundary from the base of Mt. St. Elias northward.

Barren Ground Caribou

Characterized by smaller body size, light antlers with three or four palmations, and pale color. The Old World Reindeer belongs in this group.

Barren Ground Caribou.—*Rangifer arcticus arcticus* (Richardson).

Much smaller than the Woodland Caribou. Total length, 76 inches; tail vertebræ, 6 inches; hind foot, 20.5 inches; height at shoulder, 42 inches; weight about 300 pounds. Winter pelage is noticeably paler than summer. Winter:

back grayish brown or drab, some brown on muzzle and on legs; elsewhere white to yellowish white. Summer: white or whitish on underparts, patch around tail and buttocks, and narrow band above hoofs; elsewhere light brown to umber brown, darkest along back.

Labrador Barren Ground Caribou.—*Rangifer arcticus caboti* G. M. Allen.

"Resembles *R. arcticus* of Arctic America, but the antlers have, in the adult males, a more sweeping backward curve, and their tips are carried farther forward. . . . Both brow tine and bez tine are greatly developed. . . . The summer pelage is of the usual gray above, with a marked white eye ring. The winter condition I do not know." (Allen)

Found in Labrador.

Ogilvie Barren Ground Caribou.—*Rangifer arcticus ogilvyensis* (Millais).

Larger and darker than typical *arcticus*; smaller than *osborni* but somewhat like it in appearance. Found in the Ogilvie Mountains, north of Dawson, Yukon, Canada.

Peary Caribou; Ellesmere Land Caribou.—*Rangifer pearyi* Allen.

Smaller than *arcticus*; nearly all white except for a small patch of light grayish brown (almost lilac) along back from shoulders to rump. A flat skin measures 66 inches in length. Found in Ellesmere Land, 79° north latitude.

Greenland Caribou.—*Rangifer grænlændicus* (Gmelin).

Small, pale, and with slender antlers; darker in color than *pearyi*, dark slaty brown on back. Found in Greenland.

Stone's Caribou.—*Rangifer stonei* Allen.

A large, dark-colored member of the Barren Ground group; top of head blackish, end of muzzle whitish; top and sides of neck dark grayish brown; underside of neck with long white fringe; upperparts, legs, and upperside of tail dark brown, palest on shoulders; no caudal patch; belly blackish brown; white band above hoofs; antlers heavy with many, well-developed tines. Total length, 85 inches; tail vertebræ, 6 inches; height at shoulder, 52 inches. Found on the Kenai Peninsula, Alaska.

Grant Caribou.—*Rangifer granti* Allen.

Similar to *stonei* but smaller. Dark brown on upperparts; rump patch white; sides of neck light gray with creamy tinge; end of muzzle whitish; top of nose dark brown to blackish; belly yellowish white; antlers large and fairly heavy, brow antlers well developed. Total length, 76 inches; tail vertebræ, 8 inches; hind foot, 23 inches; height at shoulder, 50 inches. Found on the treeless western end of the Alaskan Peninsula.

Point Barrow Caribou.—*Rangifer excelsifrons* Hollister.

Known only from a skull which differs from other North American Caribou in having a very high braincase. Found at Point Barrow, Alaska.

Dawson Caribou

Dwarf Caribou; Dawson Caribou; Queen Charlotte Island Caribou.—*Rangifer dawsoni* Seton-Thompson.

Small in size, antlers poorly developed; color pattern differing from usual Caribou type. General color uniform drab brown without white or black anywhere. Total length, 54 inches; tail vertebræ, 3 inches; hind foot, 15 inches; height at shoulder, 33 inches. Found only on the Queen Charlotte Islands—Graham Island—and probably extinct.

* * * * *

The Caribou is known to most people as the Reindeer. The Reindeer is an Old World species of *Rangifer* most like the Barren Ground Caribou of North America. Although we have many forms of Caribou in the New World and there are several quite distinct types of this genus (when extreme examples are selected), the common characters are not obscured and the animals are easily recognized as Caribou. The members of this genus are the only Deer in North America the females of which are horned.

Although Caribou range south far enough to overlap the range of other Deer (*Odocoileus*) and are found with the Moose in many places, the greatest numbers of Caribou are found in the far north where the peculiar adaptability of this animal allows it to successfully combat an environment which the other Deer find impossible.

The Woodland Caribou, as its name suggests, lives in the northern forests of birch, alder, and conifers. These Deer congregate in bands for the winter but during the summer are scattered as individuals or small family parties. This species has not been able to withstand continued hunting, being rather stupid and slow in escaping danger, and has become exterminated over the extreme southern part of its range. Within the United States it will soon become extinct unless a program of conservation is rigidly adhered to.

The great herds of Caribou are found on the Barren Grounds and the members of these herds are commonly known as Barren Ground Caribou. Formerly these herds numbered high into the thousands, even the hundred thousands, but in recent years so much extravagant destruction has taken place that now the bands are much smaller. Against modern firearms, the Caribou has little chance, and great numbers can be

killed from a single herd. These bands of Barren Ground Caribou wander about with the seasons in search of food and this species is more gregarious in habit than the Woodland species.

The Caribou which are found in the northern Rockies are the largest of the genus and some of these mountain forms have enormous antlers which are much prized as trophies by the sportsman.

Family *Antilocapridæ*. Pronghorn

Horned ungulates of medium size; both sexes bearing deciduous horns on permanent bony cores; horns branched but cores simple; orbit just below base of horn; lachrymal pit, tarsal, and metatarsal glands absent; glands between digits; cutaneous glands present under ear, on hip, rump and back of hock; mammæ four; pelage long, coarse and brittle.

Genus *Antilocapra*

Dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

Pronghorn.—*Antilocapra americana*

and related subspecies

Names.—Pronghorn; Pronghorn Antelope; American Pronghorn; American Antelope; Antelope. Plate XLI.

General Description.—A rather small ungulate, with horns (worn by both sexes) slightly curved and simple in character, carrying one lateral prong. Horns deciduous and shed annually, the new horns forming on the permanent bony cores; hair light and peculiar in structure, the individual hair being pith-like in texture with large air-content; form of animal light and graceful, a cursorial, plains type; tail rather short; color pattern light and with rump patch capable of "flashing"; ears large and pointed.

Color.—Sexes colored almost alike; seasonal variation not very conspicuous.

Upperparts.—Rich reddish brown or tan with darker brown to blackish on mane which runs along neck; yellowish white to whitish on rump, lower sides, sides of head, and base of ear; muzzle and a patch under ear dark brown to black.

Underparts.—Whitish or creamy white along chest, belly, and inside of legs; underside of neck crossed with two broad white bars.

Females usually with less dark brown or black than males.

Immature like adults by end of first summer; at first grayish brown with faint suggestion of adult pattern in paler rump and darkened head; never spotted like young Deer.

Measurements.—Males larger than females. Total length, males, about 54 inches, females, about 50 inches; tail vertebræ, males and females, 5.5 inches; hind foot, males, 17



FIG. 115.—Pronghorn

inches, females, 16 inches; height at shoulder about 34 to 36 inches (males); weight, males, 100 to 125 pounds.

Geographical Distribution.—See map on opposite page

Food.—Grasses, weeds, cactus, sagebrush, greasewood, wild flowers, etc.

Enemies.—Wolves, Coyotes, Eagles (young animals).

PRONGHORN

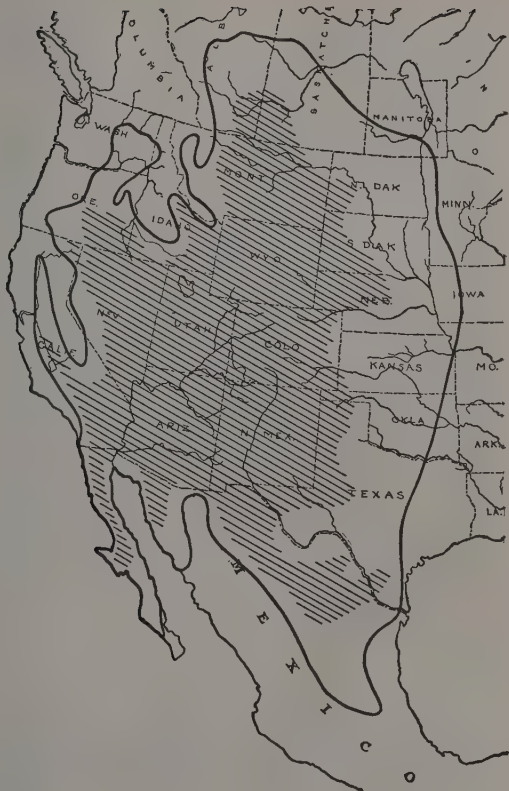


FIG. 116. Distribution of the Pronghorn, after Nelson. The continuous black line limits the early range and the shaded area indicates the distribution of the present scattered bands.

Species and Subspecies of the Genus *Antilocapra*

American Pronghorn.—*Antilocapra americana americana* (Ord).

As described. Found from the Mexican boundary northward, see map.

Mexican Pronghorn.—*Antilocapra americana mexicana* Merriam.

Paler in color, brown with a tinge of ecru or cinnamon, than typical *americana*. Found only along Mexican boundary and thence southward.

* * * * * * *

"The pronghorn is the only antelope in the world with branched or pronged horns and has the unique characteristic among all hollow-horned ruminants of shedding the outer covering of the horns annually. This takes place soon after the rut in November and December in the Yellowstone National Park in northern Wyoming, and elsewhere in the range of the species this time probably varies somewhat with latitude.

"When the time for shedding arrives the horny sheath gradually loosens and becomes detached from the skin around the base and, following this, from the bony core within. Later the horn falls off, leaving the bony core covered with a blackish skin more or less overgrown with long, coarse hairs, which afterward are gradually lost. A new horny nucleus develops on the tip of the bony core, the horny growth then extending slowly downward until it reaches the base. Gradually thickening and hardening, the horny material grows at the tip until the new horn attains its full development. The horns continue to grow as the animal increases in age until the full size is reached.

"Both sexes have horns, those on the does being smaller and slenderer than on the bucks.

"*Rump patch.*—Another characteristic of these interesting animals is a conspicuous rump patch composed of white hairs which are longer than those elsewhere on the animal's back. Through developments in the skin muscles the pronghorn at times of excitement has the power to erect these white hairs until they stand out stiffly over the rump, forming a great dazzlingly white rosette, like a giant chrysanthemum, which, when the animal is dashing away across the plains in the bright sunlight, is extraordinarily conspicuous. The writer

has many times discovered bands of antelope running on the open plains where but for these heliographic patches they would have been beyond ordinary eyesight. These long rump hairs lie like other hairs on the skin and give little indication of their strikingly conspicuous appearance until the animal suddenly throws them up into action. The antelope fawns at a very early age begin "flashing" their white rump patches on being startled or excited.

"*Curiosity*.—In addition to its physical peculiarities the pronghorn is very different psychologically from any other of our large-game animals. Early in their acquaintance with these animals hunters became familiar with their intense curiosity, and have employed various methods to toll them within gunshot. One of these was to lie on the ground and wave a red flag slowly back and forth on a ramrod. Another strange performance often said to have the same effect was for a hunter to lie on his back and kick his heels in the air.

"The natural home of the pronghorn was on the treeless, grassy, and often desert plains of the continent. The animals would scatter singly or in small bands in spring and summer, especially during the period when the does were caring for their young fawns. As winter approached they began to gather in bands, sometimes containing thousands of individuals, and to seek favorable feeding grounds for the winter." (Nelson, E. W., *Status of the Pronghorned Antelope, 1922-1924*, U. S. Dept. of Agri. Dept. Bull. No. 1346, Aug. 1925.)

The fawns number two as a general rule, but sometimes there may be three. They are born in May or early June.

Family **Bovidæ**. Cattle, Sheep, Antelopes, and Goats

Both sexes (usually) with permanent, hollow horns grown on bony cores which arise from the frontal bones; canines and upper incisors absent; second and fifth digits rudimentary or absent.

Genus **Bison**

Dentition: Incisors, $\frac{2}{2}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

American Bison.—*Bison bison*

and related subspecies

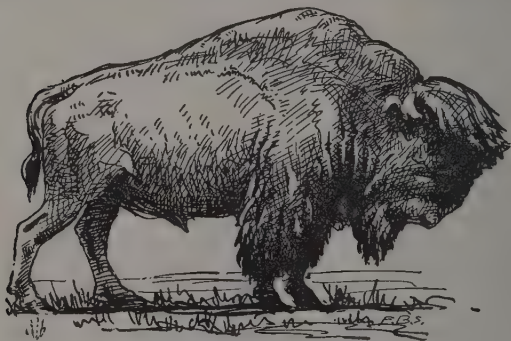
Names.—American Bison; American Buffalo. Plate XLV.**General Description.**—A very large bovine with long shaggy hair; short curved horns; high hump at the shoulder; and long hair on head and chin, especially heavy on males.**Color.**—A slight difference in color between sexes. Males dark brown on head, lower neck, legs and tail, lighter brown

FIG. 117. Bison

on rest of upperparts. Females with less contrast between shades of brown on head and back, otherwise like males.

Immature.—Yellowish brown or dull reddish yellow at birth, like female at end of six months, then deep glossy brown at two year old stage, followed by the lighter colors of adult pelages.**Measurements.**—Males decidedly larger than females. Bulls.—Total length, about 11 feet; tail vertebræ, 24 inches; hind foot, 24 inches; height at shoulder, about 70 inches; weight 1800 pounds average, reaching more than 2200 for big, old bulls. Cows.—Total length, about 7 feet; tail vertebræ, 18 inches; hind foot, 20 inches; height at shoulder, about 60 inches; weight about 800 to 1200 pounds.**Geographical Distribution.**—Formerly over most of the Great Plains section from Texas north to about 60° and from the Rocky Mountains across the Mississippi; existing today

only in game reserves, zoological parks, or as privately owned herds.

Food.—Vegetation, principally grasses.

Enemies.—Wolves, Grizzly Bears.

Species and Subspecies of the Genus **Bison**

Plains Bison.—*Bison bison bison* (Linnæus).

As described. The common and most abundant race, with an ancient range from about the Rio Grande north into Alberta and Saskatchewan where it met the range of the Wood Bison, and from the plains of the Columbia River as far east as western New York.

Wood Bison.—*Bison bison athabascæ* Rhoads.

Larger and darker in color than typical *bison*. Known only from a section in Mackenzie, Canada, where a herd still lives under essentially primitive conditions. These Bison may be considered as the last remnant of the great original herds.

Eastern Bison.—*Bison bison pennsylvanicus* (Shoemaker).

An extinct race apparently of the Wood Bison type, larger and darker than the Plains Bison; said to be very black, with short, crisp, curly hair, with some white about nose and eyes, and stated to lack the hump! Found in the forests of Pennsylvania and north to Lakes Erie and Ontario and the last were killed about 1800.

* * * * *

The Bison is too well known to call for much comment in a field book. It will be encountered today only as a park or reservation mammal and most of us will see it only through a fence. The few remaining wild Bison, the Wood Bison, are in a remote and rather inaccessible part of Canada. A strong public sentiment for the preservation of the Bison has been aroused and it is likely that the species will continue to exist indefinitely as a protected mammal, for it has done well in recent years, so well, in fact, that the surplus animals are beginning to be a problem.

The cow Bison has usually one calf a year.

Genus **Ovibos** ¹

Dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

¹ For a full revision of this genus see J. A. Allen, *Memoirs American Museum of Natural History*, New Series, Vol. I, Part IV, 1913.

Muskox.—*Ovibos moschatus*

and related forms

Names.—Muskox; Musk Bison or Musk Buffalo (old accounts). Plate XLV.

General Characters.—A long-haired, shaggy, wild Ox rather smaller than a domestic Ox; the males with broad, downward curving horns which nearly meet over the midline



FIG. 118. Muskox

of the skull to form a broad frontlet; horns of females not so broad and expanded; form robust; legs short and stocky; tail short; pelage exceedingly long and concealing the true form of the animal; a fine, soft wool or underfur present.

Color.—Sexes colored very much alike; no very marked seasonal variation except in length of pelage and worn, shed appearance of summer coat.

Upperparts.—Nearly black except for brownish black dorsal region and lighter brown "saddle" mark behind shoulders; no white on head except for possible scattering of white hairs on face; nose white; feet white.

Underparts.—Dark like upperparts.

Females sometimes with more white on head than males.

Immature with more white on head.

Measurements.—Males larger than females. Total length, males, 96 inches; tail vertebræ, 4 inches; hind foot, 20 inches; height at shoulder, 59 inches.

Geographical Distribution.—Arctic America.

Food.—Low-growing vegetation such as mosses, lichens, grass, willows, etc.

Enemies.—Wolves.

Species and Subspecies of the Genus *Ovibos*

Barren Ground Muskox.—*Ovibos moschatus moschatus* (Zimmerman).

As described above. Found from about 60° north latitude north to Coronation Gulf and from Hudson Bay west to the 120th meridian.

Hudson Bay Muskox.—*Ovibos moschatus niphæcus* Elliot.

"The males are similar in coloration to males of *O. m. moschatus* except that they are rather more intensely black, while the horns are lighter colored; usually there is no or very little white on the head; females and young males have a variable amount of white on the head and face, in some specimens nearly as much as in average individuals of *O. m. wardi*." (Allen) Total length, males, 92.5 inches; tail vertebræ, 2 inches; height at shoulder, 52 inches; weight, 579 pounds. Found about the head of Wager Inlet west to Baker Lake and thence westward toward Great Slave Lake. Limits of range unknown or where *niphæcus* merges into typical *moschatus*.

White-faced Muskox.—*Ovibos moschatus wardi* Lydekker.

Not as dark-colored as the two preceding forms and with much more white on face and head. Found "from the eastern coast of Greenland, in about latitude 70°, northward to North Greenland and thence westward from Grant Land to Banks Land, or from longitude 20° W. to 125° W., and south to Boothia Peninsula and Victoria Land (formerly) in latitude 70°." (Allen)

* * * * *

The Muskox, with the exception of the Bison, is the only American wild Ox and is a unique and characteristic animal of our Arctic fauna. It is preeminently adapted for an Arctic existence, not only through its ability to withstand long exposures to very low temperatures, due to its superb coat of heavy hair, but because it can scrape away the snow and ice and feed on lichens and other procumbent vegetation.

Against natural enemies, chief of which is the Wolf, the

Muskoxen band together, the old males with their heavy horns facing the enemy from the outside of the circle, the females and young within. Unfortunately these wild Cattle have no adequate defense against man and are faced with actual extermination everywhere except in the most northern parts of their range. The Eskimos in some sections depend largely upon Muskoxen for food and clothing, and make no effort to conserve the herds. White explorers and hunters have been guilty of ruthless killings, and those who know the Arctic best are predicting the doom of the Muskox.

Although fossil Muskoxen have been found in northern Eurasia, the living forms are to be found only in North America and Greenland.

Genus *Ovis*

Dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{8}{8}$; Molars, $\frac{8}{8}$ = 32.

Mountain Sheep.—*Ovis canadensis*

and related forms

Names.—Mountain Sheep; Rocky Mountain Sheep; Big-horn Sheep; Bighorn; Rocky Mountain Bighorn. Plate I.

General Description.—A large, wild Sheep; the males with massive horns which curl back, out and up, females with small horns; pelage hairy not woolly; glands in all four feet, four hoofs on each foot; a gland under each eye; chin beardless; tail short; mammae two in number; eyes amber to golden yellow; horns dark brown; hoofs black.

Color.—Ewes similar to rams but usually less strongly marked, paler. Seasonal variation is from darker shades in fall or late summer to much lighter coats in spring when wear has removed the dark tips of the hairs.

Upperparts.—Brownish to grayish brown, darkest on back of neck, throat, legs and dorsal line from rump to end of tail; sides slightly paler than back; rump patch creamy white.

Underparts.—Yellowish white with broad encroachment of brown from sides and heavy wash of sooty brown on chest and insides of legs.

The above is taken from a specimen in the American Museum which is dated September 21, and is consequently in fresh pelage.

Immature similar to ewes.

Measurements.—Rams much larger than ewes. Rams, total length, 60-70 inches; tail vertebræ, 5 inches; hind foot, 15-16 inches; height at shoulder, 38-42 inches; weight, 200-300 pounds for old animals; horns measure along front curve,



FIG. 119. Mountain Sheep

up to 49 inches (*Rowland Ward's Records of Big Game*, 1922) as the largest recorded, but anything over 40 inches is very good.

Ewes.—Total length, 54-60 inches; tail vertebræ, 4.75-5 inches; hind foot, 15.5 inches; weight, 125-175 pounds.

Geographical Distribution.—Mountainous sections west of 100th meridian from Mexico north to Arctic Circle. Detailed ranges given under list of species and subspecies.

Food.—Vegetation such as grass, tender plants and wild flowers, and some browse.

Enemies.—Cougars, Wolves, Lynx, and Eagles (lambs only).

Species and Subspecies of the Genus *Ovis*

The classification of the Mountain Sheep is not in a very satisfactory condition. Many names exist and much splitting up of forms has taken place. It is not likely that there are as

many distinct sheep as recent lists would indicate, since the range of individual variation is large and will account for some of the supposed differences.

Rocky Mountain Bighorn.—*Ovis canadensis canadensis*¹ Shaw.
As described. Found from Alberta south through Colorado to New Mexico and central Arizona; through eastern Washington and Oregon. Plates I and XL.

Audubon Bighorn.—*Ovis canadensis auduboni* Merriam.

As large or larger than typical *canadensis*; dentition much heavier. Weights as given by Audubon, ram 344, ewe 240 pounds. Found formerly in the Badlands district along the Missouri, Yellowstone, and Little Missouri Rivers, in eastern Montana, Wyoming, North and South Dakota, and western Nebraska. Said by Bailey, 1926, to be probably extinct.

Lava Beds Bighorn.—*Ovis canadensis californiana* (Douglas).

Darker in color than typical *canadensis*. Found in "Formerly the Cascade Mountains of southern Washington and Oregon, and Mount Shasta and the mountainous country to the eastward in northern California; now probably extinct." (Allen—1912)

Galliard Bighorn.—*Ovis canadensis gaillardi* Mearns.

Paler than typical *canadensis*, with shorter pelage and longer, more pointed ears; rump patch less sharply differentiated. Found in "Mountains of northwestern Sonora and southwestern Arizona." (Allen)

Sierra Nevada Bighorn.—*Ovis canadensis sierræ* (Grinnell).

Similar to typical *canadensis*, but "size slightly less, pelage not quite so heavy, coloration very much paler, and horns in cross-section at base not triangular." (Grinnell) Found in the high Sierras from Mono County south to the vicinity of Mount Whitney, California.

Texas Bighorn.—*Ovis canadensis texiana* Bailey.

Color of a September specimen: "upperparts, except the usual large white rump patch, dull buffy brown or soiled brownish gray; nose whitish; rump patch pure white with median dark line very narrow and not continuous from tail to dark area of back; belly white posteriorly; whitish lines down inner side of hind legs to hoofs, and down front legs usually only to dewclaws (in the type reaching to the hoofs)." (Bailey) Resembling *auduboni* in heavy dentition. Found in the Guadalupe Mountains of Texas and New Mexico.

¹ Since the nomenclature of this field book follows that of Miller in his *North American Recent Mammals*, no departure from it is made in this case, but there are very good grounds for using the name *cervina* for *canadensis*, which would make the first seven forms listed all subspecies of *cervina*.

Nelson Bighorn; Desert Bighorn.—*Ovis canadensis nelsoni* (Merriam).

Much paler than typical *canadensis*, smaller in size and with smaller molar teeth; resembling *stonei* in color pattern but paler. Found in "mountains of southern Nevada, southern California, and northern border of Lower California." (Allen)

White Sheep; Dall Sheep.—*Ovis dalli dalli* (Nelson).

Very similar to the Rocky Mountain Bighorn in general appearance except for color which is white to whitish marked with dusky; smaller size; more slender horns. Color white except for a variable amount of dusky-tipped hairs along back and some brownish on tail. Specimens from the Kenai Peninsula and Alaska Range are practically pure white. Total length, males, 58 inches; tail vertebrae, 4 inches; hind foot, 16.7 inches; weight, about 200 pounds. Found in "Greater part of Alaska and Yukon, and south-eastward in the Mackenzie Mountains." (Allen)

So variable is the color pattern of the northern Bighorn Sheep that there seems to be more or less complete intergradation from the pure white of typical *dalli* to the very dark pelage of *stonei*. Plate I.

Kenai Bighorn.—*Ovis dalli kenaiensis* Allen.

Very similar to typical *dalli* and indistinguishable from it, according to Osgood. Found on the Kenai Peninsula of Alaska.

Stone Bighorn; "Black Sheep."—*Ovis dalli stonei* (Allen).

Closely related to typical *dalli*, but averaging much darker in color. Prevailing coloration varying from dark gray to blackish brown; somewhat resembling typical *canadensis*, but darker in general tone, smaller and horns more slender and outwardly curving. Found in northern British Columbia, north to about 64° in the Yukon. Plate I.

The type of *Ovis cowani* Rothschild, described from near Mt. Logan, British Columbia, is a very dark (said to be deep black) specimen and probably is referable to *stonei*.

Ovis canadensis nigra Millais

Ovis canadensis samilkameenensis Millais } = *Ovis dalli stonei*.

Fannin Sheep.—*Ovis dalli fannini* (Hornaday).

So closely allied to typical *dalli* as to be indistinguishable from it, according to Osgood. The type specimen is intermediate in color between pure white Sheep from the Kenai Peninsula and the dark, blackish brown Sheep of the Stikine. Type locality, near Dawson City, Yukon.

* * * * *

Mountain Sheep are not liable to confusion with any other of our native mammals. The massive, curling horns will at

once identify the males as Mountain Sheep, and even the smaller horns of the females are diagnostic. Although these animals are true Sheep, the pelage is hairy and not woolly. Mountain Sheep are found in both the Old and New Worlds and some of those which are found in Asia are very similar to our own Bighorns.

These mammals are mountain climbers, as the name Mountain Sheep implies, and are not found away from steep slopes or rough, broken country. In the United States they are usually found in the higher mountains; at least that is the case today; formerly they lived in broken country at lower elevations but they have been so severely hunted that they now seek the most inaccessible localities. Mountain Sheep share with the Mountain Goat the claim to mountain climbing championship. They are sure-footed mountaineers and climb up and down precipitous slopes where man could not hope to pass.

In the northern part of the Rocky Mountain chain the Sheep have become strongly marked, although very variable, and specimens range from pure white to almost black. The extreme types of coloration are easily identified but the intermediate examples will be troublesome. These northern forms have lighter, less massive horns than the southern Sheep, but in every other respect are similar.

Mountain Sheep are active throughout the year, moving about somewhat with the seasons to follow the feed. They may be seen at any hour of the day, but often lie down to rest or take the sun, after feeding during the early morning, and do not resume grazing until late in the day.

The ewes have one or two young which are born early in the spring. The voice of the Mountain Sheep is a loud snort for the adult and a shrill blat for the kid. They are not often heard to make any vocal noise, but will frequently betray their presence by dislodging loose rock as they walk.

Genus *Oreamnos* ¹

Dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$ = 32.

¹ For an account of this genus see Madison Grant, *The Rocky Mountain Goat*, Ninth Annual Report of the New York Zool. Soc., 1905.

Mountain Goat.—*Oreamnos americanus*

and related forms

Names.—Mountain Goat; Rocky Mountain Goat; American Chamois; White Goat; Mazama. Plate XLVI.

General Description.—A large white Mountain Antelope of about the size and general appearance of a very large Goat; both sexes horned; horns rather small, slender, and slightly



FIG. 120. Mountain Goat

curved backward; pelage long, shaggy and with woolly underfur; chin with short beard; tail short.

Color.—Sexes colored alike; no essential change in color with the seasons.

Everywhere white, with more or less pale yellowish tinge; horns blackish.

Immature pelage like that of adults.

Measurements.—Males larger than females. Total length,

males, 66 inches; tail vertebræ, 6.5 inches; hind foot, 13.5 inches; height at shoulder, 41 inches; weight 150 to 300 pounds, or even more in rare cases; average weight probably about 200 pounds. Horns of old males reach 10 to 12 inches in length.

Geographical Distribution.—Rocky Mountains and coast ranges from Alaska south to Montana and Idaho.

Food.—Foliage of mountain plants; moss, lichens, grass, twigs, and brush.

Enemies.—Cougar and Golden Eagle, and on occasion Bears and Wolves.

Species and Subspecies of the Genus *Oreamnos*

Cascade Mountain Goat.—*Oreamnos americanus americanus* (Blainville).

As described above. Found in the Cascade Mountains of Washington, and possibly south into Oregon where formerly they occurred in some numbers.

Columbian Mountain Goat.—*Oreamnos americanus columbiæ* Hollister.

Resembling typical *americanus*, but larger and with narrow skull. Height at shoulder, male, 43 inches. Found in northern British Columbia; type taken in the Shesley Mountains.

Montana Mountain Goat.—*Oreamnos americanus missoulæ* (Allen).

Like typical *americanus* in external characters, but smaller (smallest of the forms) and skull narrow. Found in Montana and Idaho.

Alaska Mountain Goat.—*Oreamnos kennedyi* Elliot.

Probably a race of *americanus*, but described as a full species and so listed by Miller in his *North American Recent Mammals*. Resembling *americanus*, but horns more flaring and widespread. Found in the mountains at the mouth of Copper River, Alaska.

* * * * * * *

The animal which we know as the Rocky Mountain Goat is really one of a small group of mountain-frequenting Antelopes of which the European Chamois is a member. It has been suggested that our animal be called the American Chamois, but it is scarcely to be expected that this name will meet with popular favor, for the beast looks enough like a Goat to give a sufficient reason for the currently accepted name, and Mountain Goat he is likely to remain until the end of his days.

MOUNTAIN GOAT

The Rocky Mountain Goat is a conspicuous creature in his all-white coat, under most circumstances. A dweller upon the high peaks where snow is a common feature of the landscape, he may easily escape attention when motionless upon a white background but, in the southern part of his range at least, he often leaves the snow to wander across the brown slopes and then he becomes especially conspicuous. The chief requisites for a successful goat hunter are a sturdy pair of legs and good lungs. The shooting of the game is not difficult once the hunter has climbed up into the goat zone and there is no need of the skill which a deer stalk demands. Also, the head of even the largest of Mountain Goats is small when considered as a trophy, for the horns are short and lacking in majesty. The great shaggy coat is worthy of a better pair of horns.

The fact that *Oreamnos* lives only in the highest, roughest mountain ranges or in the high latitudes, apparently acts as a protecting factor for an animal that would otherwise have been exterminated before this. In the southern part of its range the Rocky Mountain Goat is seldom seen much below timber-line and the wilder and more precipitous the region the more abundant the Goats. Plate XLVII.

The kids vary in number from one to two, and are born in late April or May.



Order XENARTHRA. American Edentates

Mammals of primitive type; teeth absent to numerous; teeth when present exhibit imperfections such as deficiency of enamel and lack of roots, and are not differentiated.

Family Dasypodidæ. Armadillos

Small to medium-sized mammals having the greater part of the skin ossified; teeth numerous, unrooted, simple, and usually undifferentiated; forefeet with strong, curved claws for digging; hind feet plantigrade; zygomatic arch complete.

Subfamily Dasypodinæ

Genus Dasypus

Dentition: Incisors, $\frac{0}{0}$; Canines, $\frac{0}{0}$; Premolars and Molars, $\frac{8}{8}$ or $\frac{7}{7}$ = 32 or 28.

Armadillo.—*Dasypus novemcinctus texanus*
(Bailey) Plate II.

Names.—Texas Nine-banded Armadillo; Texas Armadillo.

General Description.—A peculiar, shell-covered mammal about the size of a small House-cat but heavier. Body completely enclosed, with exception of underparts and limited areas about legs, neck, and base of tail, in a dense, hard "shell" which is an ossified dermal growth built up of small plates. Head small and narrow, with one large, immovable shield; ears large, naked; entire forepart of body enclosed in a solid shield; nine movable, transverse bands across middle of back and down sides; rump and hind parts enclosed in solid shield; tail long, tapering, completely enclosed, above and below by overlapping rings; hair practically absent on upperparts, sparsely scattered on underparts. Legs short; four claws visible on forefeet, well developed, two middle claws excessively developed for digging; five well-developed claws on hind feet.

ARMADILLO

Color.—Sexes colored alike, no seasonal variation.

Shell-like structures mottled brownish and yellowish white; scattering hairs yellowish.

Measurements.—Sexes of equal size. Total length, 32 inches; tail vertebræ, 15 inches; hind foot, 4 inches.



FIG. 121. Armadillo

Geographical Distribution.—From the Rio Grande of Texas south into Mexico; north to about 33° latitude and west to Devils River.

Food.—Insects.

Enemies.—Probably able to defend itself against the small carnivores by rolling up in its armor, but defenseless against Wolves, Coyotes, Bobcats, Cougars, etc.

* * * * *

But the one form of Armadillo is found north of the Rio Grande; southward the group is a fairly large one.

The only personal experiences which I have had with Armadillos have been in Ecuador, but I imagine that the behavior of the Nine-banded Armadillo is very much the same wherever you find it. Those that I saw seemed to have very poor sight and were more disturbed by a heavy or incautious step than by the fact of my visual presence which would have been very obvious to any other mammal. Even the bright light I used in night hunting failed to alarm them and the entire attention of the animals was upon the ground. They moved in jerky, nervous fashion, poking into every hole and giving the impression of an energetic busybody. When finally alarmed they ran full speed, with a great commotion of brush and foliage. They are active mostly at night.

Vernon Bailey, in his *Biological Survey of Texas, North American Fauna* No. 25, pp. 54-56, gives a very good account of the Texas Armadillo.

"They are partial to low, dense cover of coarse grass, thorny thickets, cactus patches, and scrub oaks, under which they make numerous burrows and trails, or root about in the leaves and mold, where they enjoy comparative safety under the double protection of leafy screen and armor plate. But they thrive best in a rocky country, especially where limestone ledges offer numerous caves and crevices of various sizes, from which they can select strongholds that will admit no larger animal. Almost every rock-walled gulch along the headwaters of Guadalupe River has one or more dens with smoothly worn doorways from which much traveled trails lead away through the bushes or to little muddy springs, where tiny hoof-like tracks and the corrugated washboard prints of ridged armor suggest that the armadillos not only dig and nose about in the soft ooze for their insect food, but, pig-like, enjoy also a cooling mud bath. Other trails lead along rocky shelves, up the sides of gulches, and away from thicket to thicket, and are easily followed sometimes for half a mile till they branch and scatter or connect with cattle trails, where the rope-like prints of dragging, horny tails are visible among the dusty cow tracks. Late in the afternoon one occasionally meets an armadillo trotting vigorously along a trail on his stumpy little feet, his tail dragging after him in a useless sort of way as he hurries nervously across the open spaces and stops in the thickets to nose about under the leaves in search of dainties from the fragrant soil. At such times the long, pointed nose seems to be the keenest organ of sense. The little eyes, half the time buried in rustling leaves, rarely detect an object not close by and in motion. I have followed one of these pre-occupied little animals for half an hour, often within 20 or 30 feet, moving only when it was rustling in the leaves, and watching its motions without being discovered or creating alarm. Hunters say that if you stand still the armadillos will sometimes bump against your feet without discovering you, so short sighted are they and so intent on their own business. But when alarmed, they get over the ground with a rush that is surprisingly rapid considering their turtle-like build. If the first rush does not carry them to cover and an enemy over-

ARMADILLO

takes them, they curl up in an ironclad ball that is not easily uncurled. In autumn, during the deer hunting months, when the young of the year are full grown, they are especially numerous and particularly obnoxious to the still hunters, who repeatedly mistake their rustling in the leaves for the noise of feet of bigger game. Where a dozen or twenty armadillos are met in a day's hunting, as sometimes happens, and possibly no deer are seen, the nervous strain and disappointment on the part of the hunter sometimes result in serious consequences to the innocent armadillo.

"The excrement of the armadillos found scattered along the trails in the form of clay marbles and with the texture of baked mud gives some clue to the food habits of the animals. Careful examination shows only the remains of insects, mainly ants and a few small beetles, embedded in a heavy matrix of earthy matter."

The young, four to eight in number, are born from February to April, and at first have soft flexible skins which show the pattern of the armor that will come with time. As the young mature the armor hardens until finally it reaches the bony stage.



Order SIRENIA. Manatees, Dugongs, and Sea-cows

Highly specialized aquatic mammals of large size; body fusiform; head rounded; muzzle truncate; nostrils separate, valvular; eyes small; mouth of comparatively small size, lips set with bristles; tail flat, broad, expanded horizontally; no dorsal fin; forelimbs developed as swimming paddles; no trace of hind limbs; bones dense and massive; habit completely aquatic; diet herbivorous.

Family Trichechidæ. Manatees

Characters as given for the Order Sirenia and under the genus *Trichechus*.

Genus *Trichechus*

Dentition: Incisors, $\frac{2}{2}$; Canines, $\frac{0}{0}$; Premolars and Molars, $\frac{8}{8}$ to $\frac{11}{11}$ = 32 to 52.

Manatee.—*Trichechus latirostris* (Harlan)

Names.—Florida Manatee; Florida Seacow; American Manatee.

General Description.—A large, heavily-built, aquatic mammal of psuedo fish-like form. Body robust and rounded; head grotesque, with thick pendulous lips and blunt, truncate muzzle; upper lip cleft medially; forelimbs modified into broad flappers; no traces of hind limbs; tail broad, flat, horizontal; eyes minute; nostrils valve-like; external ear very small, a mere orifice. Skin practically naked but muzzle set with stiff bristles.

Color.—Everywhere dull grayish.

Measurements.—A large male which was in the New York Aquarium measured 7 feet, 6 inches in length and weighed 432 pounds. Bangs records a female 11 feet, 4 inches long and two others, sex not given, as 12 feet and 13 feet, 7 inches

long respectively. The estimated weight of the 12 foot specimen was 2000 pounds.

Geographical Distribution.—Found along the east coast of Florida as far north as Daytona, and sporadically along the Gulf coast; has been reported from Corpus Christi, Texas.

Food.—Vegetation found in shallow estuaries and lagoons.

Enemies.—None, with the possible exception of sharks.

* * * * * * *

Only the one species of *Trichechus* is found on the continental shores of North America.* A related species, *T. manatus*, is found in the West Indies.

The Manatee is a harmless, rather sluggish creature which



FIG. 122. Manatee

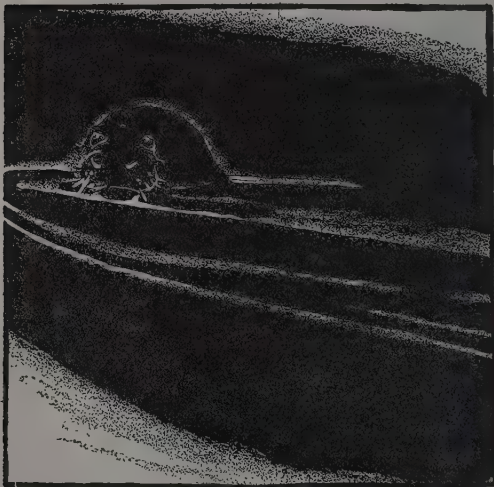
has become so specialized for an aquatic life that it is almost helpless upon the land. It has been said to come out upon the shore sometimes, to feed upon some particularly tempting stretch of grass, but it is difficult to see how such a clumsy creature could progress upon land. The heavy-bodied Manatee has lost even the transient relationship with the land which the Seals possess and spends its entire existence in a restricted area of shallow water.

The bones of this mammal are very dense and heavy and are an aid in keeping it submerged. The mobile lips are cleft along the mid-line above, and each half is capable of motion independent of the other side. The upper lip thus becomes a useful grasping member and the Manatee gathers in tufts of marine vegetation at the bottom of the lagoons.

The one Manatee which I have seen came to the surface of the water in Old Harbor Bay, Jamaica, fairly close to my rowboat. The head of the animal looked more like a small keg bobbing on the waves than anything alive. After a moment for respiration the Manatee quietly sank out of sight.

Fishermen occasionally catch the Manatee in their nets, and it has been noted that unusually severe winters, such as that of 1894-95, lower the temperature of the shallow waters sufficiently to kill numbers of Manatee.

The Manatee is said to have one young a year.



Order CETACEA.¹ Whales and Porpoises

Mammals greatly modified for an aquatic habitat; external form fish-like; body more or less rounded and tapering without distinct constriction in neck region; tail developed into paired lateral propelling organs or "flukes" which form a horizontal mass of tissue terminating in a notch in the midline; head large; lips immobile; forelimbs modified into swimming paddles with no differentiation into arm, forearm, or digits, and enclosed in a continuous integument; no external trace of hind limbs; skin usually hairless, smooth, shining; just under skin a thick mass of fatty areolar tissue, the "blubber"; median dorsal fin usually present; nostrils opening through paired or single valve-like aperture near crown of head; eyes small; no external ear, the meatus opening into a minute orifice in the skin.

Whales and Porpoises will be so seldom seen by most of the users of this field book, at least under circumstances which permit the observation of identifying characteristics, that it is inadvisable to go into details as to specific characterization. For the sake of completeness, however, all of the forms liable to be encountered on our shores are given at least a passing mention, and most of the more common Whales and Porpoises are described and figured.

After all, there are great gaps in our knowledge of the Cetacea. The very fact that these animals live in a medium which man can only skirt on the surface, and spend such a great part of their existence under the surface of the water, precludes the intimacy of contact which we may hope to enjoy with the land mammals. We know that many species are great wanderers and that their ranges cover an enormous area. Many are confined by the more or less invisible and unknown barriers of food supply, ocean temperatures, depths and currents, and we have each ocean or sea with its own peculiar cetaceans. There is a great scarcity of recorded

¹ See Miller, Smithsonian Misl. Coll., Vol. 76, No. 5, 1923, for a classification of the subgeneric groups of this order.

data and, although these animals have served as the basis of a great industry, few of the whalers troubled to write down their observations, and not many competent observers have spent the time necessary to learn much of cetacean life-histories. One of the classical accounts from which a large part of our knowledge is derived is Scammon's *Marine Mammalia and American Whale Fishery*.

Suborder MYSTICETI. Baleen Whales ¹

Toothless Whales (no teeth present after birth) having plates of baleen or whalebone along upper jaw; lower jaws not united at symphysis by a bony suture but connected by fibrous tissue; nostrils opening as paired "blow-holes"; olfactory lobe developed.

Family *Balænidæ*. Whalebone Whales

Mandible deep; rostrum high and arched; cleft of mouth a curved line; lumbar vertebræ ten or more.

Genus *Eubalæna*

North Atlantic Right Whale.—*Eubalæna glacialis* (Bonaterre)

General Description.—A large Whale, length about fifty feet, with large head; long, narrow baleen, black in color; short, broad pectoral fin, enclosing the bones of all five fingers; no dorsal fin; no furrows on skin of throat.

Color.—Generally black, but sometimes mottled or pied with white.

Measurements.—Sexes about equal in size; True gives lengths of American specimens varying from 30 feet to 53 feet.

Geographical Distribution.—North Atlantic; has been taken from shores of South Carolina northward.

¹ See True, *The Whalebone Whales of the Western North Atlantic*, Smithsonian Contributions to Knowledge, Vol. 33, 1904, and G. M. Allen, *The Whalebone Whales of New England*, Memoirs, Boston Society of Natural History, Vol. 8, No. 2, 1916.

Pacific Right Whale.—*Eubalæna sieboldii* (Gray).

Resembling *Eubalæna glacialis*, but with a large, rough protuberance at end of upper jaw, and wart-like bunches on lips and head; superior outline of head not so convex as in the Bowhead; baleen coarse; length 60–70 feet. Found in the North Pacific from California to the Aleutian Islands.



FIG. 123. Right Whale

Genus *Balæna*

Bowhead; Greenland Right Whale.—*Balæna mysticetus* Linnæus

General Description.—A large Whale, 50 to 65 feet long, with very large head and highly arched upper jaw; head more than one-third of total length; baleen very long, finely fringed.

Geographical Distribution.—Circumpolar seas.



FIG. 124. Bowhead Whale

Family *Rhachianectidæ*. Gray Whale

Mandible heavy and slightly bowed outward; rostrum deep rather than broad; supraorbital process of frontal depressed; nasals greatly enlarged.

Genus *Rhachianectes***Gray Whale.**—*Rhachianectes glaucus* (Cope)

Names.—Gray Whale; California Gray Whale.

General Description.—A medium-sized Whale—females about forty feet in length, males somewhat smaller, about thirty-five feet—varying in color from light mottled gray to almost black; two longitudinal folds under throat, about fifteen inches apart and six feet in length; eye slightly above and

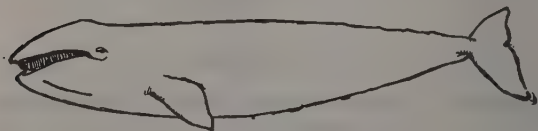


FIG. 125. California Gray Whale

behind angle of mouth; external ear a small slit in skin about two and a half inches long; no dorsal fin; pectoral fin narrow; blubber six to ten inches thick; baleen fourteen to sixteen inches long; not often passing far out to sea, but following the shore and spending much time in shoal bays and lagoons; spout quick and low; social in habit and congregating in large numbers when undisturbed; now very greatly reduced in numbers and threatened with extinction.

Geographical Distribution.—In North America along Pacific coast.

Family **Balænopteridæ.** Finback Whales,
Rorquals, Humpback Whales.

Mandible conspicuously bowed outward; rostrum broad rather than deep.

Subfamily *Balænopterinae*

Genus *Balænoptera*

Common Finback Whale.—*Balænoptera physalus* (Linnæus)

General Description.—A large Whale reaching a length of 65 feet or more; head flat; body slender; small, curved dorsal fin present; pectoral fin small and narrow; longitudinal furrows

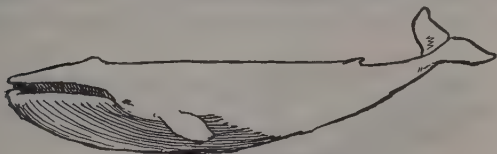


FIG. 126. Finback Whale

on throat and breast; baleen short and coarse; black to blackish brown above and on sides, belly white; spout quick and energetic, high and columnar; inspiration accompanied by a peculiar and characteristic sound audible for a considerable distance; active in habit and sometimes plays about ships; when "sounding" it may heave its flukes out of water and assume a nearly vertical position; seen singly or in small numbers.

Geographical Distribution.—Atlantic and Pacific oceans.

Species of the Genus *Balænoptera*

Common Finback.—*Balænoptera physalus* (Linnæus).

As described above.

Pollack Whale; Rudolphi's Rorqual.—*Balænoptera borealis* Lesson.

More robust in body than *physalus*; dorsal fin large and falcate. Rare in American waters; recorded from coasts of Florida and Virginia.

Pike Whale; Little Piked Whale; Least Rorqual.—*Balænoptera acutorostrata* Lacépède.

Body more robust than in *physalus*; pectoral fins small, dorsal fin quite high, with strongly curved tip; upper jaw acutely narrowed anteriorly. Total length, 20-30 feet. Found in North Atlantic; south to coast of New England; New York and New Jersey.

Genus *Sibbaldus***Sulphur-bottom Whale.**—*Sibbaldus musculus*
(Linnæus)

Names.—Sulphur-bottom Whale; Blue Whale; Sibbald Whale.

General Description.—Largest of all the Whales, reaching a known length of 103 feet (average length 60–80 feet); head long; baleen short, black to bluish in color; dorsal fin small and curved; pectoral fin small; small, longitudinal furrows on



FIG. 127. Sulphur-bottom Whale

throat; body comparatively slender; "weight of whole animal, by calculation, 147 tons" (taken from Scammon—a 95 foot specimen); a 76 foot Whale from Newfoundland was said to weigh 63 tons; spout tall and vertical; very active in habit, swiftest of the Whales, speed when alarmed estimated at 12 miles per hour.

Color.—Slaty gray to mottled bluish gray above; underparts varying from white to yellowish or grayish marked with irregular white areas.

Geographical Distribution.—Found on both Pacific and Atlantic shores.

Subfamily *Megapterinæ*Genus *Megaptera***Humpback Whale.**—*Megaptera nodosa* (Bonaterre)

General Description.—A proportionally short and thick-bodied Whale, reaching a maximum length of about 50 feet; dorsal fin present as a low "hump"; pectoral fin very long and narrow, knobbed along anterior margin; flukes large, pos-

terior margin crenulated; color black with variable white mottling below; longitudinal furrows along throat and belly, about 26 in number; lower jaw extending well beyond upper; baleen short; spout issuing from a pair of spiracles as twin

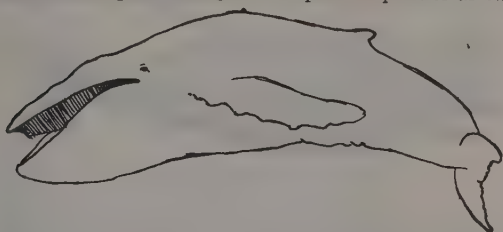


FIG. 128. Humpback Whale

columns which unite and expand; blowing from one to fifteen or twenty times to a "rising"; spout may reach 20 feet or more in height; animals may be encountered singly or in numbers.

Geographical Distribution.—In North America, on Atlantic and Pacific coasts.

Suborder ODONTOCETI. Toothed Cetaceans

Teeth always present after birth, usually numerous, but in some species only a few are functional (none functional in some instances); no baleen; upper surface of skull more or less asymmetrical, nostrils opening as a single spiracle; lower jaws united by a symphysis; olfactory organ rudimentary or absent.

Family *Physeteridæ*. Sperm Whales

Head very large; mandible slender and toothed; upper jaw large and toothless.

Genus *Physeter*

Sperm Whale.—*Physeter catodon* Linnaeus

Names.—Sperm Whale; Cachelot; Pottfish (German).

General Description.—A large, toothed Whale; length reaching 70 to 85 feet for the largest males, females only about

a third of this; head huge, deep and square, with large, oil-filled reservoir overlying rostrum and cranium; spiracle or blow-hole single, not paired as in the baleen Whales, external opening somewhat S-shaped; dorsal fin absent; pectoral fin



FIG. 129. Sperm Whale

broad and short; teeth in lower jaws only, 22 to 24 on each side; throat large, capable of swallowing large masses; color blackish above, lighter below; spout slow and prolonged, diagonally forward in direction; social in habit, congregating in schools of fifteen or more (in times of former abundance in schools of hundreds). Food: squid, octopus, and some species of fish.

Geographical Distribution.—Formerly found in nearly all seas from 56° north latitude to 50° south, now scarce over much of this range.

* * * * *

Ambergris comes from Sperm Whales and is an intestinal secretion, taken either from the dead animal or found floating or cast up on the beach. It varies in color from yellowish to dark brownish, is rather firm and hard after exposure to the air, and is often confused with various other oily or greasy substances such as mineral waxes or waste products from steamers. Ambergris is used as a base for perfumes and is quite valuable. It is a difficult substance for the layman to identify or analyze and a sample of the suspected substance should be sent to a chemical laboratory before spending any of the anticipated receipts from a sale of the find!

Family Kogiidae. Pigmy Sperm Whales

"Facial depression moderately developed, . . . brain relatively large, . . . zygoma incomplete; . . . " (Miller)



FIG. 130. Pigmy Sperm Whale

Genus *Kogia*

Pigmy Sperm Whale.—*Kogia breviceps* (Blainville).

Size small (9–13 feet long); snout short; mouth in inferior position; blow-hole placed far back on head; dorsal fin low but well developed, falcate. Has been taken at scattered localities along the Atlantic seaboard, but is apparently a rare animal. It has almost a cosmopolitan distribution and may turn up anywhere.



FIG. 131. School of Dolphins

Family Delphinidæ. Porpoises, Dolphins, etc.

Small to medium-sized cetaceans having teeth, usually numerous, in both jaws; rostral portion of skull elongated.

Subfamily Delphininæ

Genus *Prodelphinus*

“Color black or gray above, light below, with spots or longitudinal bands.” (True)

Spotted Dolphin.—*Prodelphinus plagiodon* (Cope).

Total length about 84 inches. Found along the Atlantic coast of United States; Cape Hatteras; Gulf of Mexico.



FIG. 132. Spotted Dolphin

North Atlantic Dolphin.—*Prodelphinus euphrosyne* (Gray).
Total length about 84 inches. Found in Atlantic Ocean from South Greenland to Jamaica and east to Europe.

Genus *Steno*

"Color black above, white below, with or without dark longitudinal bands." (True).



FIG. 133. Long-beaked Dolphin

Long-beaked Dolphin.—*Steno rostratus* Gray.
Total length about 100 inches. Found in the Atlantic Ocean to Indian Ocean; American record from Tampa, Florida.

Genus *Delphinus*

Color markings variable; black to dark gray on upperparts, tail and fins; white to greenish white on underparts.

Common Dolphin.—*Delphinus delphis* Linnæus.
Total length about 89 inches. Found on both coasts.

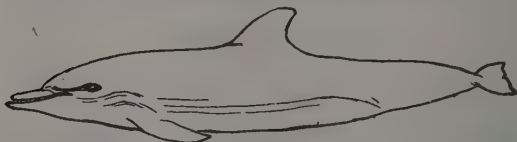


FIG. 134. Common Dolphin

PORPOISES, DOLPHINS

Genus *Tursiops*

"Color gray or greenish, lighter below, sometimes with spots." (True)

Bottlenosed Dolphin.—*Tursiops truncatus* (Montague).

Total length about 114 inches. Found on Atlantic coast from Maine to Florida; in Gulf of Mexico to Texas.



FIG. 135. Bottlenosed Dolphin

Pacific Bottlenosed Dolphin; Cowfish.—*Tursiops gillii* Dall.

Found in the North Pacific Ocean: Monterey, California and Lower California.

Andrews Bottlenosed Dolphin.—*Tursiops nuuanu* Andrews.

Recorded from the Pacific Ocean from Santa Catalina Island and southward.



FIG. 136. Pacific Bottlenosed Dolphin

Genus *Lissodelphis*

Color everywhere black except for white on extremity of lower jaw and a large area between pectoral fins which extends as a line to flukes.

Pacific Right Whale Porpoise.—*Lissodelphis borealis* (Peale).
Total length about 97 inches. Found in the North Pacific Ocean: California.



Fig. 137. Pacific Right Whale Porpoise

Genus *Lagenorhynchus*

"Sides with two areas of light color separated by irregular, oblique dark bands." (True)

Striped Dolphin; Striped Porpoise; White-sided Dolphin.—*Lagenorhynchus acutus* (Gray).

Total length about 99 inches. Found in the North Atlantic Ocean, south to the coast of the United States; Cape Cod.

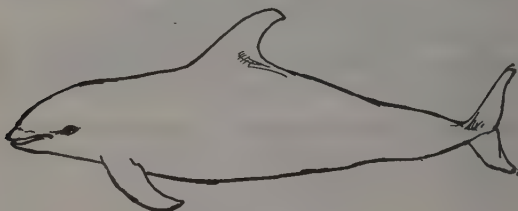


FIG. 138. Striped Dolphin

White-beaked Dolphin.—*Lagenorhynchus albirostris* Gray.

Like *acutus*, but forehead more swollen, larger pectoral fins and more strongly reclined dorsal fin. Base of forehead, beak, and mandible white, more or less tinged with gray. Found in North Atlantic Ocean; Greenland; Davis Strait.

Pacific Striped Dolphin.—*Lagenorhynchus obliquidens* Gill.

Much like *acutus*. Total length about 87 inches. Found in the North Pacific Ocean: California; Puget Sound.

Genus *Orcinus*

"Color black, with a large and sharply contrasted ventral area of white, forming a trident posteriorly, the lateral tines of which extend up on the sides." (True).

Atlantic Killer.—*Orcinus orca* (Linnæus).

Total length 20 feet or more. Found in all seas.

PORPOISES, DOLPHINS

Pacific Killer.—*Orcinus rectipinna* (Cope).

No large white spot back of eye. Total length of male about 20 feet. Found in the North Pacific Ocean, south to the Coast of California.

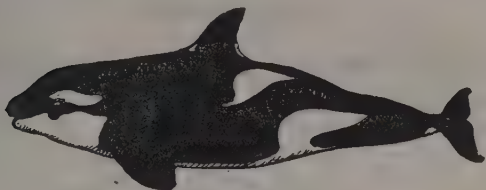


FIG. 139. Atlantic Killer

Genus *Grampus*

"Color slate-gray, mottled, and very irregularly streaked." (True).

Grampus.—*Grampus griseus* (Cuvier).

Total length about 126 inches. Found in the North Atlantic and North Pacific Oceans; south along coasts of United States as far as New Jersey and California.



FIG. 140. Grampus

Genus *Pseudorca*

"Color uniform black." (True)

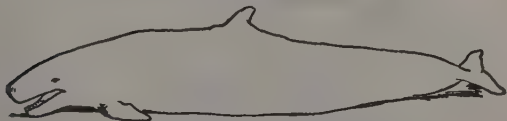


FIG. 141. False Killer

False Killer.—*Pseudorca crassidens* (Owen).

Total length about 16 feet. Found in all seas; recorded from Florida.

Genus *Globicephala*

Color black.

Blackfish; Pilot Whale; Ca'ing Whale.—*Globicephala melæna* (Traill).

Total length about 15 to 19 feet. Found along the Atlantic coast of North America to New Jersey.



FIG. 142. Blackfish

Short-finned Blackfish.—*Globicephala brachyptera* (Cope).

Total length about 15 feet. Pectoral fins shorter than in *melæna*, about one-sixth the total length of the body, or less. Found on the Atlantic coast from New Jersey to the Gulf of Mexico. Plate XLVIII.

Scammon Blackfish; North Pacific Blackfish.—*Globicephala scammonii* (Cope).

Much like *brachyptera*; pectoral fins a trifle longer proportionally. Total length about 15 feet. Found in the North Pacific Ocean.

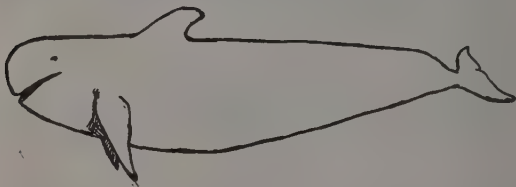


FIG. 143. Scammon Blackfish

Genus *Phocæna*

Color above slaty black, below lighter (females white below); color never in spots.

PORPOISES, DOLPHINS

Harbor Porpoise; Bay Porpoise; Herring Hog.—*Phocæna phocæna* (Linnæus).

Total length about 68 inches. Found on both coasts, ascends rivers.



FIG. 144. Harbor Porpoise

Genus *Phocænoides*

Dall Porpoise.—*Phocænoides dalli* (True).

Dorsal and ventral margins of the body near the flukes raised into prominent, thin ridges; head without beak. Color black, with large whitish area on belly and lower side as far forward as plane of dorsal fin. Total length about 72 inches. Found on the coast of Alaska.

Subfamily *Delphinapterinæ*

Genus *Delphinapterus*

Color everywhere white.

White Whale; Beluga.—*Delphinapterus leucas* (Pallas).

Total length about 11 to 12 feet. Found in Arctic and sub-arctic seas; recorded from as far south as Atlantic City, New Jersey.



FIG. 145. White Whale

Subfamily **Monodontinæ**

Genus **Monodon**

Males with a long tusk; females usually not showing tusks externally. Color above dark gray, below white, sides and back mottled with gray.

Narwhal.—*Monodon monoceros* Linnæus.

Total length about 12 feet. Found in Arctic Seas.

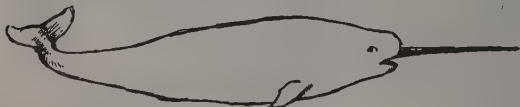


FIG. 146. Narwhal

Family **Ziphiidæ**.¹ Beaked Whales

"Teeth of adult reduced to one or two in lower jaw, absent in upper jaw; rostrum deepened and solidified; . . ."
(Miller)



FIG. 147. Baird Whale

Genus **Berardius**

Baird Whale.—*Berardius bairdii* Stejneger.

Color black, except for grayish or whitish area on lower belly. Total length about 40 feet. Found in the North Pacific Ocean from Bering Sea south to California.

Genus **Mesoplodon**

Sowerby Whale.—*Mesoplodon bidens* (Sowerby).

Snout elongated into a beak; a single pair of teeth placed well back on the lower jaw. Total length about 16 feet.

¹ See F. W. True: *An Account of the Beaked Whales of the Family Ziphiidæ in the Collection of the United States National Museum*. U. S. N. M. Bull. 73, 1910.

BEAKED WHALES

Found in the North Atlantic Ocean; recorded from Nantucket Island, Massachusetts.



FIG. 148. Sowerby Whale

Blainville Whale.—*Mesoplodon densirostris* (Blainville).

Total length about 12 feet. Found in the Indian Ocean and about Australia, but recorded from Massachusetts and New Jersey.

Gervais Whale.—*Mesoplodon europæus* (Gervais).

Larger than *bidens* and with shorter and narrower pectoral fins. Color above very dark slate-gray, lighter on sides and whitish on belly. Total length up to 22 feet. Found in the North Atlantic Ocean; recorded from New Jersey.

Stejneger Whale.—*Mesoplodon stejnegeri* True.

Teeth more than twice as broad and longer than those of *bidens*; end of beak blunt, lower jaw longer than upper. Total length about 16 feet. Found in the North Pacific Ocean from Bering Island to Oregon.

True's Beaked Whale.—*Mesoplodon mirum* True.

Mandibular teeth at extremity of jaw; in female, very small and concealed in the integument. "Back, slate-black; lower side, yellow-purple, flecked with black; median line of belly somewhat darker, a grayish area in front of vent; fins the color of the back." (True) Total length about 16 feet. Found along the southeastern coast of the United States; North Carolina.

Genus *Ziphius*

Cuvier Whale.—*Ziphius cavirostris* G. Cuvier.

A single pair of good-sized teeth at end of lower jaw. Color variable, from black to gray above, sometimes white on



FIG. 149. Cuvier Whale

head and back as far as dorsal fin; underparts lighter than upperparts. Total length about 18 to 20 feet. Found in all seas.

Genus *Hyperoodon*

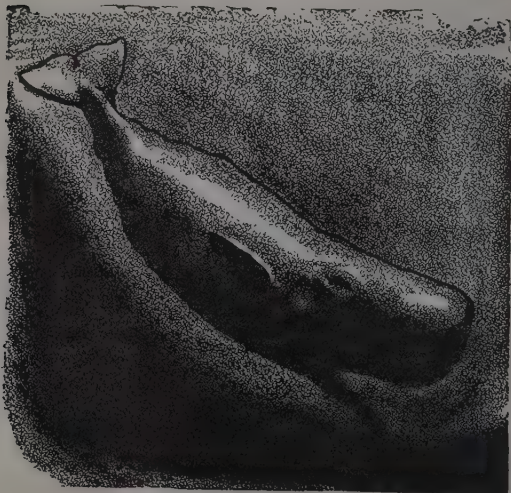
Bottlenose Whale.—*Hyperoodon ampullatus* (Forster).

Teeth confined to a single pair, hidden in the gum at the end of the lower jaw; beak well developed. Color above, varying from black to light brown, sometimes almost yellow,



FIG. 150. Bottlenosed Whale

with whitish about head; below grayish white. Total length, about 24 feet for females, 30 feet for males. Found in Arctic and North Atlantic oceans; recorded from New York Bay, Newport, Rhode Island, and Cape Cod, Massachusetts



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Rocky Mountain Sheep



Ewe



Ram

Dall Mountain Sheep



Stone Mountain Sheep



Opossum



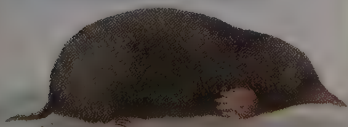
Armadillo



Little Brown Bat



Red Bat



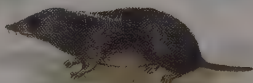
Eastern Mole



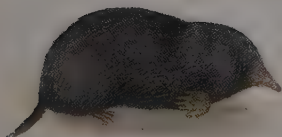
Masked Shrew



Water Shrew



Short-tailed Shrew



Brewer Mole



Star-nosed Mole



Big Brown Bat



Oregon Mole



Kermode Bear



Cinnamon Bear



Glacier Bear



Black Bear



Grizzly Bear



Alaska Brown Bear



Ring-tailed Cat



Raccoon

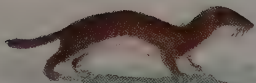




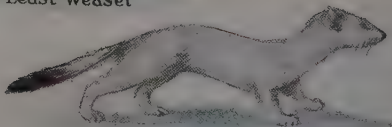
Marten



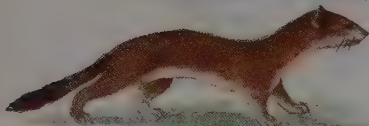
Fisher



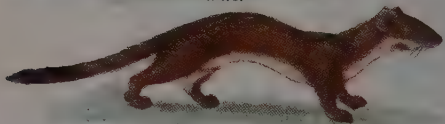
Least Weasel



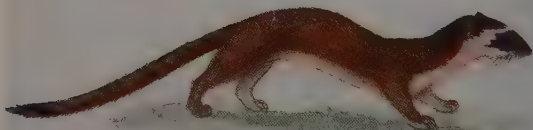
Arctic Weasel - winter -



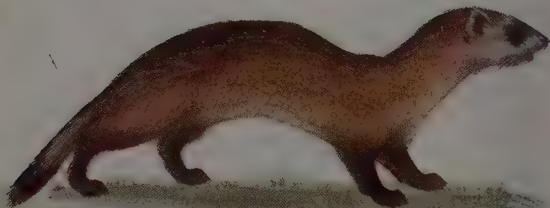
Arctic Weasel - summer -



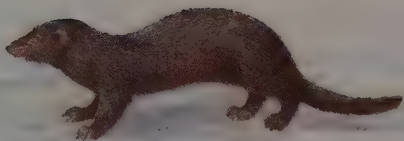
New York Weasel



Bridled Weasel



Black-footed Ferret



Mink



Otter



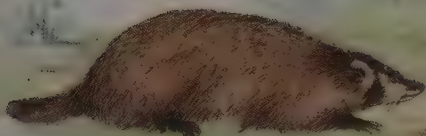
Little Spotted Skunk



Hog-nosed Skunk



Common Skunk



Badger



Wolverine



Cross Fox



Red Fox



Kit Fox



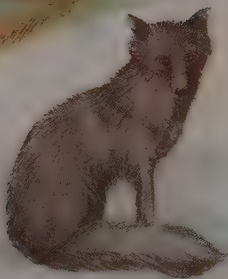
Silver Fox



Arctic Fox
winter



Arctic Fox
summer



Blue Fox



Gray Fox



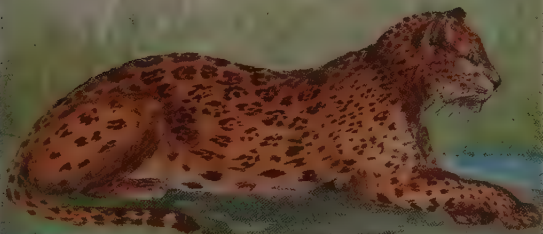
Coyote



Gray Wolf



Cougar



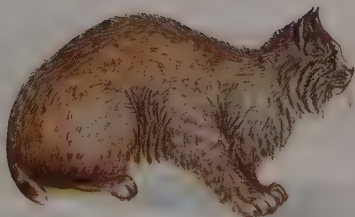
Jaguar



Jaguarundi



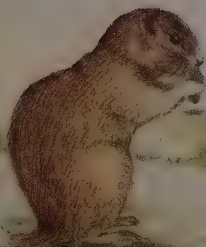
Ocelot



Bobcat



Canada Lynx



White-tailed
Prairie Dog



Black-tailed
Prairie Dog



Mountain Beaver



Woodchuck



Hoary Marmot



Antelope Ground Squirrel



Rio Grande Ground Squirrel



Thirteen Striped Ground Squirrel



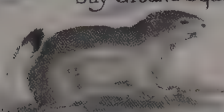
Golden Chipmunk



Say Ground Squirrel



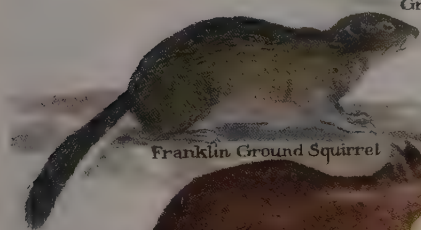
Little Gray Ground Squirrel



Nelson Ground Squirrel



Round-tailed Ground Squirrel



Franklin Ground Squirrel



California Ground Squirrel





Flying Squirrel

Red Squirrel

Douglas Chickaree

Eastern
Gray Squirrel

Fox Squirrel

Western
Gray Squirrel

Abert Squirrel



Maximilian Pocket Mouse



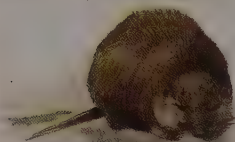
Gambel Kangaroo Rat



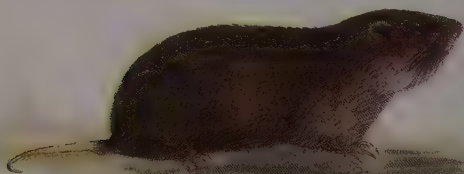
Columbian Kangaroo Rat



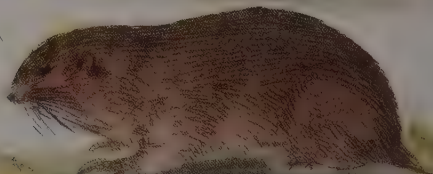
Large Kangaroo Rat



California Pocket Gopher



Camas Pocket Gopher



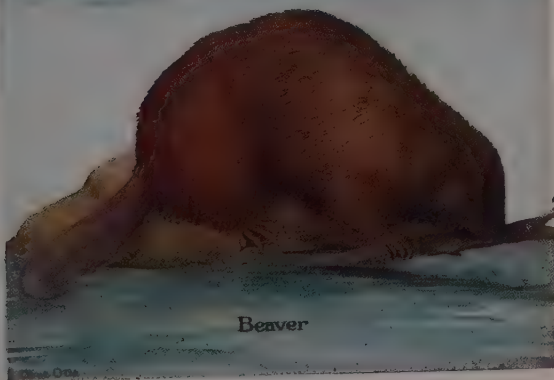
Shaw Pocket Gopher



Porcupine



Muskrat



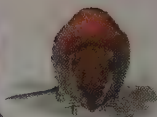
Beaver



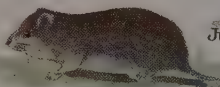
Harvest Mouse



Jumping Mouse



Red-backed Mouse



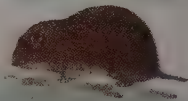
Bog-lemming



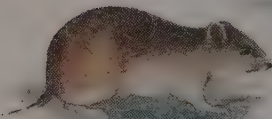
Lemming



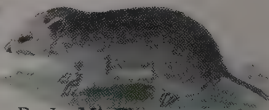
White-footed Mouse



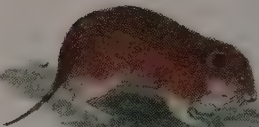
Pine Mouse



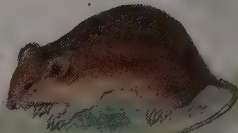
Grasshopper Mouse



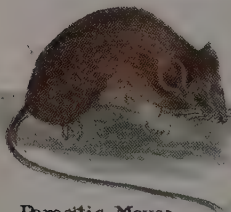
Rocky Mt. Phenacomys



Pennsylvania Meadow Mouse



Rice Rat



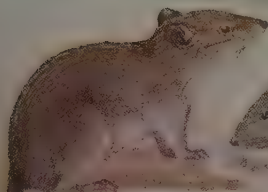
Parasitic Mouse



Big-footed Meadow Mouse



Cotton Rat



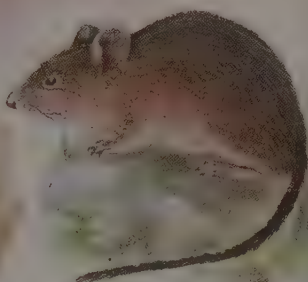
Roof Rat



Black Rat



Norway Rat

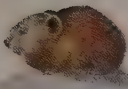


Allegheny Wood Rat



Gray Bushy-tailed

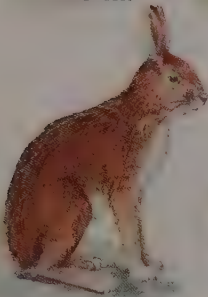
Wood Rat



Pika



Cottontail Rabbit



Varying Hare



Marsh Rabbit

Black-tailed Jack Rabbit



Arctic Hare



Antelope Jack Rabbit



White-tailed Jack Rabbit



Collared Peccary



Pronghorn Antelope



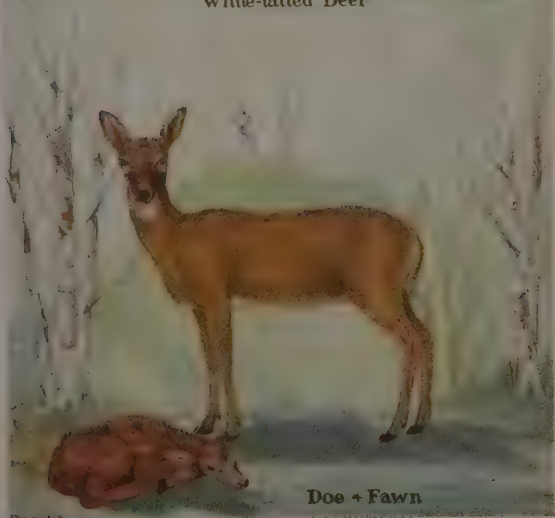
Wapiti



Moose



White-tailed Deer



Doe + Fawn



Black-tailed Deer



Mule Deer



Muskox



Bison



Rocky Mountain Goat



Woodland Caribou



Photo copyrighted by Wm. Lyman Underwood

BAY LYNX OR BOBCAT (*Lynx rufus rufus*)



Photo by H. E. Anthony

IMMATURE EASTERN RACCOON
(*Procyon lotor lotor*)



Photo copyrighted by H. H. Pittman

THIRTEEN-STRIPED GROUND SQUIRREL (*Citellus tridecemlineatus*)



Photo by A. A. Allen

LYSTER CHIPMUNK
(*Tamias striatus lysteri*)



Photo by H. E. Anthony

BEAVER HOUSE IN A LAKE IN SOUTHERN ONTARIO



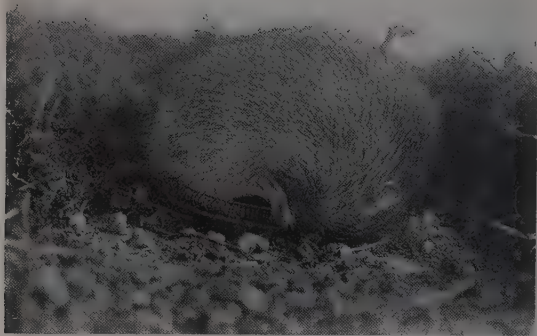
Photo copyrighted by H. H. Pittman

BAIRD WHITE-FOOTED MOUSE (*Peromyscus maniculatus beirdi*)



Photo copyrighted by H. H. Pittman

PRAIRIE JUMPING MOUSE (*Zapus hudsonius campestris*)



Photos by A. A. Allen

TWO VIEWS OF HIBERNATING JUMPING MOUSE
(*Zapus hudsonius*)

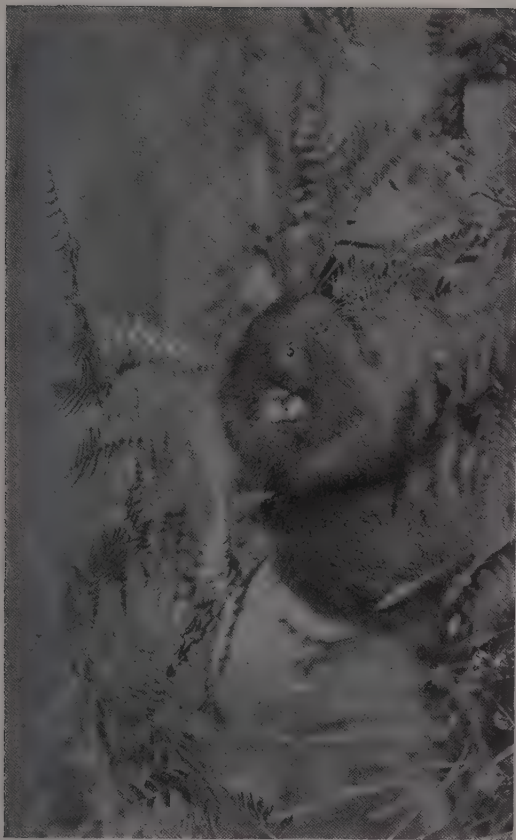


Photo by H. E. Anthony

PACIFIC MOUNTAIN BEAVER (*Aplodontia rufa pacifica*)



Photo by G. Clyde Fisher

IMMATURE CANADA PORCUPINE
(*Erethizon dorsatum dorsatum*)



Photo by E. R. Warren

FIGGINS PIKA (*Ochotona princeps figginsi*)



Photo by H. E. Anthony

"HAY" PILE MADE BY PIKA, SAWTOOTH MOUNTAINS,
IDAHO



Photo by E. R. Warren

ROCKY MOUNTAIN SNOWSHOE RABBIT
(*Lepus bairdi bairdi*)



Photo by H. E. Anthony

WASHINGTON JACK RABBIT
(*Lepus californicus wallawalla*)



Photo by E. R. Warren

ROCKY MOUNTAIN BIGHORN (*Ovis canadensis canadensis*)



Photo by Dan McCowan

ROCKY MOUNTAIN GOAT
(*Oreamnos americanus*)



SHORT-FINNED BLACKFISH (*Globicephala brachyptera*)
Photo by R. C. Murphy

